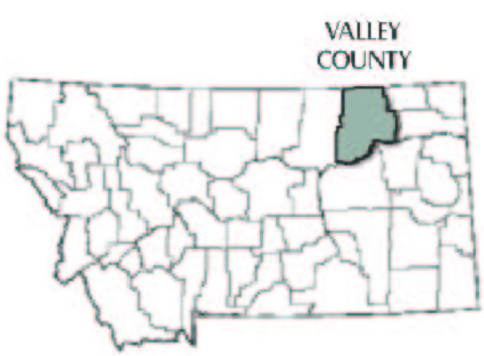
Valley County, Montana

Pre-Disaster Mitigation Plan



September 2003

MAXIM TECHNOLOGIES INC
A TETRA TECH COMPANY
ENGINEERING & ENVIRONMENTAL CONSULTANTS

VALLEY COUNTY MONTANA
PRE-DISASTER MITIGATION PLAN

Prepared for:

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September 2003

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BLM	Bureau of Land Management
COE	U.S. Army Corps of Engineers
CRP	Conservation Reserve Program
DES	Montana Disaster and Emergency Services
DOI	U.S. Department of Interior
DMA	Disaster Mitigation Act
DNRC	Montana Department of Natural Resources and Conservation
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FHMP	Flood Hazard Mitigation Plan
GIS	Geographic Information Systems
HUD	U.S. Department of Housing and Urban Development
LEPC	Local Emergency Planning Committee
MRIA	Milk River International Alliance
NFIP	National Flood Insurance Program
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resource Conservation Service
NWS	National Weather Service
PDM	Pre-Disaster Mitigation Plan
USFS	United States Forest Service
USGS	United States Geological Survey
WAPA	Western Area Power Administration

1.0 INTRODUCTION

The effects from natural and man-made hazards directly impact the safety and well being of Valley County residents. Historically, county residents have dealt with floods, high winds, severe summer storms with damaging thunderstorms, hail, and tornadoes, harsh winter storms with extreme cold and blizzards, wildfires, drought, and hazardous material spills. While most hazards cannot be eliminated, the effects from them can be mitigated. Valley County, working in conjunction with Montana DES and Maxim Technologies, Inc. (Maxim), prepared this Pre-Disaster Mitigation (PDM) Plan (the Plan) to help guide and focus hazard mitigation activities. The Valley County Pre-Disaster Mitigation Plan profiles significant hazards to the community and identifies mitigation projects that can reduce their impacts. The purpose of the Plan is to promote sound public policy designed to protect citizens, critical facilities, infrastructure, private property, and the environment from natural and man-made hazards. The Valley County Pre-Disaster Mitigation Plan includes resources and information to assist county residents, organizations, local government, and others interested in participating in planning for natural and man-made hazards. The mitigation plan provides a list of mitigation projects that will assist Valley County in reducing risk and preventing loss from future hazard events.

1.1 AUTHORITY

The Disaster Mitigation Act (DMA) of 2000 amends the Robert T. Stafford Disaster relief and emergency assistance act by adding a new section, 322 – Mitigation Planning. It requires all local governments to have an approved Pre-Disaster Mitigation Plan in place by November 1, 2003 to be eligible to receive Hazard Mitigation Grant Program project funding.

Valley County and the incorporated towns of Glasgow, Fort Peck, Nashua, and Opheim have adopted this Pre-Disaster Mitigation Plan. These governing bodies have the authority to promote sound public policy regarding natural and man-made hazards. Copies of the signed Resolutions from these jurisdictions are included as ***Appendix A*** to this plan. The Plan was adopted at the regularly scheduled meetings of the Glasgow, Fort Peck, Nashua and Opheim city councils, and at the meeting of the Valley County commissioners, all of which were open to the public and advertised through the communities' typical process for publicizing public meetings.

The Valley County Disaster and Emergency Services (DES) Coordinator will be responsible for submitting the adopted Plan to the State Hazard Mitigation Office in Helena, Montana. The State Hazard Mitigation Officer will then submit the Plan to the Federal Emergency Management Agency (FEMA) for review. This review will address the federal criteria outlined in FEMA Interim Final Rule 44 CFR Part 201. Upon acceptance by FEMA, Valley County and the other Plan signatories will gain eligibility for local mitigation project grants and post-disaster hazard mitigation grant projects (HMGP).

1.2 ACKNOWLEDGEMENTS

Many groups and individuals have contributed to development of the Valley County Pre-Disaster Mitigation Plan. The local DES Coordinator, District DES Representative, and the Montana State Hazard Mitigation Officer provided significant guidance and support to all aspects of plan development. The National Weather Service provided historic newspaper accounts of severe weather events and other weather data. Numerous elected officials, city and county personnel, and the local communities participated in the planning process and contributed significantly to the Plan's development.

1.3 PROJECT AREA LOCATION

Valley County is located in northeast Montana and has a land area of about 3,175,040 acres or 4,961 square miles (Valley County, 2001). Valley County is bounded by Daniels and Roosevelt Counties on the east, McCone and Garfield Counties to the south, Philips County to the west, and Canada to the north. The Fort Peck Indian Reservation encompasses much of the eastern portion of the county. Glasgow is the county seat and incorporated towns include Nashua, Opheim, Fort Peck, and Glasgow. Fort Peck Reservoir and the Fort Peck Dam form the southern county boundary. The Milk River and Porcupine Creek flow into the Missouri River downstream from the dam. ***Map 1-1*** is a general reference map of the county. The Fort Peck Reservation occupies area within the southeast portion of Valley County. A separate Pre-Disaster Mitigation Plan has been developed for the Fort Peck Tribes.

Elevations in Valley County range from about 2,000 to 3,300 feet above sea level. The city of Glasgow is located on the valley floor at about 2,100 feet above sea level. Hills rise sharply from the northern edge of Glasgow to flat tableland about 200 feet higher than the valley. A gradual incline commences 3 to 4 miles south and southwest of Glasgow and reaches to the rolling hills that separate the Milk River drainage from the Fort Peck Reservoir on the Missouri.

Land use in Valley County is primarily agriculture (crop and livestock production), with small communities and individual homes and farms interspersed. Croplands primarily produce small grains and hay or are idle in the Conservation Reserve Program. Native rangeland and planted pastures provide forage for livestock. Livestock obtain water from dugout impoundments, wells, and surface water.

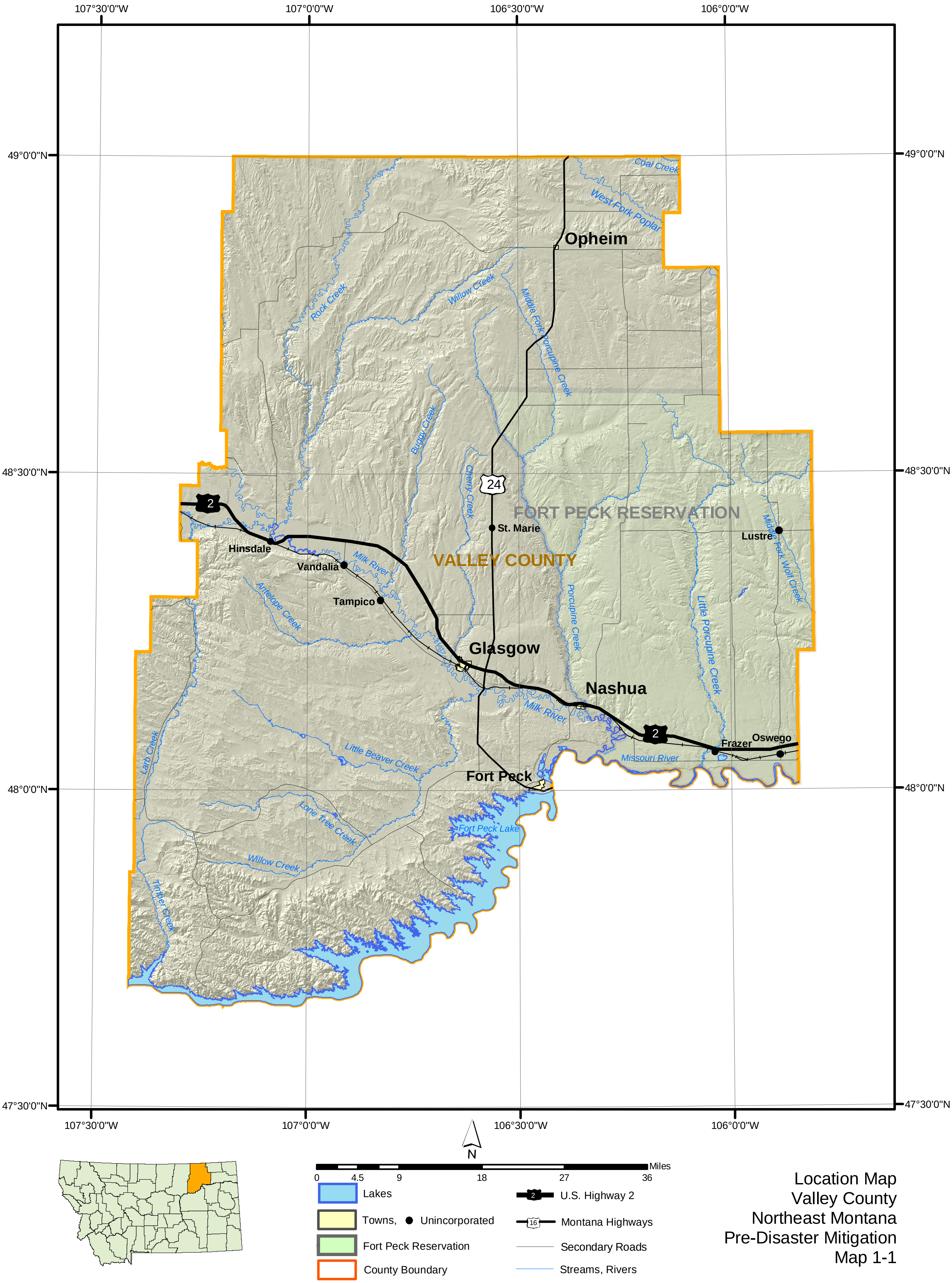
According to the 2000 census, the population of Valley County is 7,675. This represents a 6.8% decline in population in the 10 years since the last census. The median age in Valley County is 41.7 years (U.S. Bureau of the Census, 2001 in DOI, 2002).

1.4 CLIMATE AND WEATHER

Valley County, Montana is located within the region generally classified as dry continental or Steppe with four well-defined seasons. The weather can be quite changeable with large day to day temperature variations, particularly from the fall to the spring. Days with severe winter cold and summer heat are typical.

Average high temperatures in January are 15 to 25 F with average lows 5 below to 5 F above, with the coldest averages over the northeastern part of the county. In winter in particular, temperatures often vary significantly from the averages. Temperatures below -50 F have been recorded at several locations, while typical extreme winter minimum temperatures are between -25 and -35 F. Often the coldest temperatures occur at sheltered valley locations when winds are light, but extreme wind chill situations occur almost every winter when windy conditions coincide with very low temperatures. Rapid warmups during the winter and early spring can lead to significant snow melt and flooding of small streams and rivers and/or ice jam flood problems.

Average high temperatures in July are in the 80s with average lows 55 to 60, with the warmest averages along the Milk and Missouri River valleys. Brief spells with temperatures above 100 F can occur but are often short lived. Temperatures above 110 F have been reported on rare occasion. Extended periods with temperatures above 90 F occur every few years. Freezing temperatures can occur, but are rare in June and August, particularly at sheltered valley locations in the northern part of the county.



Location Map
Valley County
Northeast Montana
Pre-Disaster Mitigation
Map 1-1

Annual average precipitation is 11 to 12 inches, with over 70% of the precipitation falling from May through September. Precipitation can vary significantly from year to year, and location to location within a given year. November through March, are on average quite dry with average monthly precipitation of 0.50" or less. Average annual precipitation does not vary significantly across the county, but does appear to show a trend towards slightly heavier precipitation over the northeastern portion of the county. The heaviest most intense precipitation often occurs with localized downpours associated with thunderstorms in June through August. Significant flash flooding can result from these downpours with over 3 inches reported in a few events. Widespread heavy precipitation events of 1 to 2 inches can occur every few years and is most common from April through June and September through early November.

Average winter snowfall ranges from 28 to 38 inches, with the highest averages over the higher elevations over the northeastern part of the county. The heaviest snowstorms often occur from late March through May or mid October to mid November. These storms can produce more than 12 inches of snow and are often made more severe as temperatures are warmer, and therefore the snow is heavier and more difficult to travel in and remove. These storms are often accompanied by high winds resulting in blizzard conditions. In spring these storms can coincide with the calving season resulting in livestock loss. Mid winter snowstorms in general produce less then 6 inches of snow, but heavier amounts to 10 inches or more have occurred. Despite the generally lighter amounts and drier snow, high winds can result in blizzard conditions. Even without falling snow, in the colder conditions of mid winter, high winds can pick up loose snow, resulting in local ground blizzards.

Severe thunderstorms are common from June into early September. Typically the greatest hazards associated with these thunderstorms are very highs winds and large hail. Damage to structures and crops occur every summer from these storms. Tornadoes have been reported, but are relatively rare.

An important element of the climate in Valley County are the often windy conditions. Average wind speeds range from 10 to 15 mph, depending on the exposure of the location. The average and peak sustained winds in the Milk and Missouri River valleys tend to be somewhat less then the winds the higher more exposed terrain in the southern and northern portions of the county. The highest wind gusts often occur with thunderstorms during the summer, with gusts over 60 mph occurring every year. The highest sustained winds tend to occur in the spring and fall, with sustained winds over 40 mph occurring every year.

Table 1-1 details the top weather events recorded by the NWS at the Glasgow weather station. Temperature, precipitation, and snowfall tables for Glasgow and Hinsdale (***Table 1-1*** and ***Appendix G***) are representative of the Milk River valley region. Weather extremes for Opheim and Lustre are more typical of the northern and eastern part of the county (***Appendix G***). Temperatures are warmer during the winter over southern Valley County.

Wind data from Glasgow is typical of the Milk River region. Data from the Bluff Creek weather station is more typical for the higher more exposed terrain of the north (***Appendix G***). Wind data from the King Coulee weather station is more typical for the higher more exposed terrain of the south (***Appendix G***).

TABLE 1-1
TOP WEATHER EVENTS RECORDED AT GLASGOW WEATHER STATION

Hottest Days		Coldest Days		Wettest Days	
113°	7/31/1900	-59°	2/15/1936	3.26 inches	8/25/1933
112°	7/18/1936	-57°	2/16/1936	3.21 inches	4/2/1940
111°	8/2/1893	-56°	1/12/1916	2.96 inches	8/2/1985
111°	7/20/1893	-55°	1/12/1905	2.85 inches	8/19/1912
110°	6/17/1933	-54°	2/14/1936	2.83 inches	7/9/1946
Wettest Years		**Driest Years**		**Longest Dry Spells**	
20.37 inches	1927	6.74 inches	1984	57 days	11/1932
19.53 inches	1923	6.84 inches	1990	56 days	9/1906
17.77 inches	1962	6.90 inches	1971	52 days	9/1931
16.96 inches	1921	7.07 inches	1958	49 days	9/1965
16.27 inches	1993	7.30 inches	1960	49 days	3/1949
Snowiest Winters		**Greatest Snow Depths**		**Wettest Month**	
58.6 inches	1966-67	26 inches	2/10/1916	10.92 inches	6/1923
56.7 inches	1998-99	21 inches	1/30/1969	**Snowiest Month**	
53.7 inches	1996-97	20 inches	3/5/1979	28.8 inches	1/1916
49.4 inches	1953-54	20 inches	2/1/1971		
46.6 inches	1924-25	19 inches	1/23/1950		
Notes: Date from National Weather Service					

For the purposes of this hazard assessment and mitigation plan, weather is of interest when it threatens property or life and thus becomes a hazard. The NWS provides short-term forecasts of hazardous weather to the public, in addition to issuing tornado and severe thunderstorm watches. The NWS also produces regularly-scheduled severe weather outlooks and updates on various forms of hazardous weather including heavy rain and winter storms. NWS's Warning and Advisory Criteria for severe weather is presented in ***Table 1-2***. Descriptions of historic weather related hazard events and documentation of the frequency, severity, and impact of hazardous weather is presented in Section 3 of this plan.

TABLE 1-2
WARNING AND ADVISORY CRITERIA FOR SEVERE WEATHER

Summer Weather Event	Criteria	
Severe Thunderstorm Warning	Any thunderstorm wind gust equal to or greater than 58 mph; any hail size ¾ inch or larger.	
Tornado Warning	A violently, rotating column of air extending from the base of a thunderstorm to the ground.	
Flash Flood Warning	Flooding is imminent, water levels rise rapidly with inundation occurring in less than 6 hours.	
Flood Warning	Flooding is expected to occur more than 6 hours after the causative event.	
Winter Weather Event	**Winter Weather Advisory**	**Winter Storm/Blizzard Warning**
Snow	2-5 inches of snow in 12 hours	6 inches or more in 12 hours, or 8 inches in 24 hours
Blizzard	(see blowing snow)	Sustained winds or frequent gusts to 35 mph with visibility below a ¼ mile fro three hours or more
Blowing Snow	Visibility at or less than a ½ mile.	Visibility at or less than a ½ mile in combination with snowfall at or greater than 6 inches and/or freezing precipitation
Ice/Sleet	(see freezing rain/drizzle)	Accumulations of ¼ inch or more of ice.
Freezing Rain/Drizzle	Light precipitation and ice not forming on exposed surfaces.	None
Wind Chill	Wind chills of 20 to 39 below zero with a 10 mph wind in combination with precipitation.	Wind chills of 40 below zero or colder with a 10 mph wind in combination with precipitation.
Summer Weather Event	**Non-Precipitation Advisory**	**Non-Precipitation Warning**
High Wind	None	Sustained winds of 40 mph for an hour or any gust to 58 mph (non-convective winds).
Lake Wind	Sustained wind speeds of 25 mph or more for three or more hours.	None.
Heat	Heat index of 105 or more for at least three days.	High temperature of 105. Low of 80 or more for 3 days or more.

1.5 REGIONAL ECONOMY

The major source of income in Roosevelt and Valley counties is government, whereas the major industry in Sheridan and Daniels counties is agriculture. Average annual unemployment rates in 2000 in the four-county area ranged from a low of 3.0 percent in Daniels County to a high of 9.5 percent in Roosevelt County. Unemployment rates in Valley and Sheridan counties were 4.1 percent and 4.4 percent, respectively (Montana Department of Labor and Industry, 2001 in DOI, 2002).

The estimated percent of people of all ages in poverty in the state was 15.7 percent in 1998. Roosevelt County had the highest percent of people in poverty of the four-county area with 31.7 percent, followed by Valley County (18.7 percent), Daniels County (15.6 percent), and Sheridan County (13.7 percent) (U.S. Bureau of the Census, 2001b in DOI 2002).

1.6 SCOPE AND PLAN ORGANIZATION

The scope of the Valley County Pre-Disaster Mitigation Plan includes the following:

- Identify and prioritize disaster events that are most probable and destructive,
- Identify critical facilities,
- Identify areas within the community that are most vulnerable,
- Develop goals for reducing the effects of a disaster event,
- Develop specific projects to be implemented for each goal,
- Develop procedures for monitoring progress and updating the Plan, and
- Officially adopt the Plan.

The Plan is organized into sections that describe the planning process (Section 2), risk assessment (Section 3), mitigation strategies (Section 4), and plan maintenance (Section 5). Appendices containing supporting information are included at the end of the Plan.

2.0 PLANNING PROCESS

The Valley County Pre-Disaster Mitigation (PDM) Plan is the result of a collaborative effort between Valley County citizens, public agencies, local utility companies, and regional, state, and federal organizations. Public participation played a key role in development of goals and mitigation projects. Interviews were conducted with the Valley County DES Coordinator, mayors, and elected officials, and four public meetings were held to include the input of Valley County residents.

2.1 CONTACT LIST

The PDM planning process was initiated by preparing a contact list of individuals whose input was needed to help develop the Plan. On the County level, these persons included elected officials (County Commissioners), the DES Coordinator, and County Road Superintendent. Councilpersons from each of the incorporated towns (Fort Peck, Glasgow, Nashua, and Opheim) were contacted, as well as the mayors, fire chiefs and public works directors. Federal and State agencies on the contact list included the National Weather Service, Western Area Power, Army Corps of Engineers, and Montana Department of Natural Resources and Conservation. Private utilities included Nemont Telephone, and Sagebrush Cellular. ***Appendix B*** presents the Valley County contact list. Persons and entities on the contact list received a variety of information during the planning process, including project maps and documents for review, meeting notifications, and mitigation strategy documents.

2.2 STAKEHOLDER INTERVIEWS AND MEETINGS

Interviews were conducted with individuals and specialists from organizations interested in hazard mitigation planning. The interviews identified common concerns related to natural and man-made hazards and identified key long-term and short-term activities to reduce risk. Stakeholders interviewed for the plan included representatives from local government, water providers, fire departments, and utility providers. A list of meetings and interviews with Valley County stakeholders is presented in ***Appendix B***.

2.3 FORMAL PUBLIC MEETINGS

Four public meetings were conducted in Valley County during initial plan development. The meetings were held in Glasgow on February 26, 2003, in Nashua on February 28, 2003, in Opheim on March 10, 2003, and in Fort Peck on March 11, 2003. The purpose of the meetings was to gather information on historic disasters, update the list of critical facilities, and gather ideas from citizens about mitigation planning and priorities for mitigation goals. Sign-in sheets from the Valley County public meetings, and meeting summaries are presented in ***Appendix B***.

In advance of the public meetings, a press release was distributed to local and regional newspapers including the Glasgow Courier, Great Falls Tribune, and Billings Gazette. Local radio stations who received copies of the press release as public service announcements included KLTZ/KLAN Glasgow and Northern Ag Radio. Notices of public meetings were sent in advance to all jurisdictions participating in the planning process including Glasgow, Fort Peck, Nashua, Opheim, and Valley County. Notices were sent to all federal, state, and local officials on the project contact list (***Appendix B***). A copy of the press release and media distribution list is included in ***Appendix B***. ***Appendix B*** also contains copies of the press release as it appeared in several local newspapers. Reporters were in attendance at several of the public meetings and follow-up articles on Plan development appeared in local newspapers.

The City Council and County Commission meetings at which the resolutions adopting the plan were passed provided the public with the opportunity to review the final version of the plan.

2.4 OTHER PROJECT MEETINGS

Over the course of the project numerous meetings were held with, and briefings given to, local officials and other stakeholders. At the project's inception the Montana DES District Representive and the Project Manager for Maxim Technologies Inc., toured the project area and met with commissioners from each county, mayors for most of the incorporated towns, Tribal staff, Bureau of Indian Affairs staff, representatives from local utilities, Local Emergency Planning Committee (LEPC) members, National Weather Service (NWS) staff, US Corps of Engineers (COE) staff, county health officials, and others. The overall project objectives were presented at these meetings and initial concerns and potential mitigation projects were discussed.

On February 19, 2003, a breakfast was held at Maxim's Helena, Montana office to update elected officials on the status of Plan development. The breakfast was scheduled to coincide with the Governor's conference, since many of the Valley County stakeholders were in Helena for that purpose. Representatives from the National Weather Service, Glasgow office attended the breakfast, as did DES Coordinators on the state, regional and local levels. An overview of the PDM program was presented and the schedule for the Valley County public meetings was unveiled.

2.5 PLAN REVIEW

Review copies of the draft Plan were provided to the DES Coordinator for distribution in hard copy. Plan reviewers included county commissioners, mayors of the various jurisdictions, representatives of the local utility companies, the National Weather Service, and other federal, state, and local officials. The DES Coordinator provided review copies of the Plan to all jurisdictions involved in the planning process including Glasgow, Fort Peck, Nashua, Opheim, and Valley County. Public comments were submitted to the DES Coordinator after a 30-day review period. The DES Coordinator reviewed the comments and submitted a consolidated list of them to Maxim.

A review of the Plan for completeness was conducted after the initial comments were addressed. Plan copies were submitted to the Montana DES Hazard Mitigation Officer and the Montana FEMA representative for review. The review period lasted 30-days. Upon receipt of comments, the Plan was finalized and taken to the County commissioners and jurisdictions for adoption.

Future comments on this Plan should be addressed to:

Valley County Disaster and Emergency Services Coordinator
501 Court Square #10
Glasgow, MT 59230-2405
(406) 228-4333

3.0 HAZARD EVALUATION AND RISK ASSESSMENT

A risk assessment was conducted to address requirements of the Disaster and Mitigation Act of 2000 (DMA 2000) for evaluating the risk to the community from the highest priority hazards. DMA 2000 requires measuring potential losses to critical facilities and property resulting from natural hazards by assessing the vulnerability of buildings and critical infrastructure to natural hazards. In addition to the requirements of DMA 2000, the risk assessment approach taken in this study will evaluate risks to vulnerable populations and also examine the risk presented by man-made hazards. The goal of the risk assessment process is to determine which hazards present the greatest risk and what areas are cumulatively the most vulnerable to hazards.

The hazard risk assessment requires information about what hazards have historically impacted the community and what hazards may present risks in the future. Identifying historical and possible future hazards was primarily accomplished in two phases. The first phase entailed interviewing local government officials and staff, local emergency planning and response staff, and the general public. ***Plan Section 2*** describes the interview/public input process in detail. The second phase entailed researching government records and news publications for records of previous hazard events. The results of the initial hazard evaluation were used to focus further risk assessment on hazards that historically had caused the most problems and those judged to be of most future concern.

The risk assessment approach used for the Valley County Pre-Disaster Mitigation Plan entailed using GIS software and data to develop vulnerability models for people, structures, and critical facilities and evaluating those vulnerabilities in relation to hazard profiles that model where hazards exist. This type of approach to risk assessment is very dependent on the detail and accuracy of the data used during the analysis. The schedule and resources available for conducting this risk assessment dictated that existing data be used to perform the assessment. The existing information is extensive but also has many limitations. Results of risk assessment allow hazards to be compared and relative comparisons to be made of areas within the jurisdiction.

3.1 HISTORICAL HAZARDS

Valley County may be affected by many types of natural, technological, and human caused hazards. Examples of natural hazards that have impacted the region include earthquakes, flooding, wildfire, severe winter storms, tornadoes, and drought, among others. Technological hazards are caused by human processes. Technological hazards that exist in the region include explosions, urban fires, uncontrolled chemical or hazardous material release (either at a fixed location or in transit), power outage, and dam failure, among others. Human-caused hazards are the result of direct (purposeful) actions of humans. Possible human-caused hazards include civil unrest/riots, and terrorism.

The hazards most likely to affect Valley County were derived from a number of sources. Hazard information was compiled by examining data from DES, FEMA, the U.S. Coast Guard, and the NWS, reviewing historical newspaper articles, and interviewing local experts. Most importantly, the residents of Valley County voiced their opinions on what hazards had affected their lives and their communities during the public meetings. ***Table 3-1*** lists the historical occurrence of natural disasters affecting Valley County, including State and Federal declared disasters.

TABLE 3-1
HISTORIC FLOODS, DECLARED DISASTERS, AND WEATHER-RELATED HAZARD EVENTS IN VALLEY COUNTY

Date	Event	Area Affected	State Disaster Declaration	Federal Disaster Declaration	Remarks
July 26 1999(1)	Wildland Fires	County-wide	Yes	Yes	
June 23 1999(1)	Windstorm/Tornado	Opheim	Yes	No	
March 15, 1999(6)	Flooding	County-wide	No	No	$20K in damage
March 12 1997(1)	Flooding	Glasgow, Nashua	Yes	Yes	
September 9 1994(1)	Wildland Fires	County-wide	Yes	No	
October 1986(1)	Flooding	Glasgow	Yes	Yes	Federal disaster due to severe storms & flooding beginning 9/25/86
March 1986(1)	Flooding	Glasgow, Nashua	Yes	Yes	$161,364 in damage
March 1979(2)	Flooding	Nashua	No	No	
February 1978(1,4,5)	Winter Storm	County-wide	Yes	No	
April 1978(2)	Flooding	Nashua	No	No	
August 1975(1)	Grasshopper Infestation	County-wide	Yes	No	
July 31, 1975(4)	Tornado	Glasgow	No	No	1 fatality
June 27, 1974(4,5)	Flooding	Hinsdale	No	No	
March 21, 1974(3)	Blizzard	Opheim	No	No	
August 7, 1962(3)	Tornado	Opheim	No	No	
April 1952(2,3,5)	Flooding	Nashua, Opheim	No	No	Frenchman Dam breached
February 21, 1952(3)	Blizzard	Opheim	No	No	3 fatalities
February 5, 1947(3)	Blizzard	Opheim	No	No	
March 1943(2)	Flooding	Nashua	No	No	
March 1939(2,5)	Flooding	Vandalia, Nashua	No	No	Newly rebuilt levee saved Glasgow
June 3, 1927(3)	Flooding	Opheim	No	No	2 fatalities
May 1927(2)	Flooding	Vandalia	No	No	
March 1925(2)	Flooding	Glasgow	No	No	
July 7, 1923(3)	Lightning	Opheim	No	No	1 fatality
June 1923(2)	Flooding	Vandalia	No	No	3 fatalities
March 1918(2)	Flooding	Vandalia	No	No	Town sewer flooded
April 1917(2)	Flooding	Vandalia	No	No	
April 1912(2)	Flooding	Hinsdale	No	No	Two weeks of flooding
April 1907(2)	Flooding	Glasgow	No	No	2 fatalities(4)
June 1906(2)	Flooding	Glasgow	No	No	3 fatalities(4)
April 1899(2)	Flooding	Glasgow	No	No	
March 1888(2)	Flooding	Glasgow	No	No	Damaged Great Northern Railroad
1880(2)	Flooding	Glasgow	No	No	First known flood in County

Notes: (1) FEMA; (2) Valley County Flood Hazard Mitigation Plan 2001; (3) NWS Report on Opheim Weather; (4) NWS historic newspaper article collection; (5) Public input at meetings; (6) NWS Storm Events Database

3.1.1 Floods

A flood is a natural event for rivers and streams. Excess water from snowmelt and rainfall accumulates and overflows onto the banks and adjacent floodplains. Floodplains are lowlands, adjacent to rivers and lakes that are subject to recurring floods. A flash flood generally results from a torrential (short duration) rain or cloudburst on a relatively small drainage area. Flash floods are discussed in ***Plan Section 3.1.4***.

Hundreds of floods occur each year, making it one of the most common hazards in all 50 states. Floods kill an average of 150 people a year nationwide. Sixteen fatalities have occurred due to flooding in the Milk River watershed, a significant number considering the sparse population of the basin. Ten of these deaths occurred in Valley County, prior to 1939. Typically, flood victims were attempting to cross flooded roads and underestimated the deadly threat of the cold, slow moving, but powerful waters (MRIA *et al,* 1998). Most property damage results from inundation by sediment-laden water. Faster moving floodwater can wash buildings off their foundations and sweep vehicles downstream. Pipelines, bridges, and other infrastructure can be damaged when high water combines with flood debris. Basement flooding can cause extensive damage.

Several factors determine the severity of floods, including rainfall intensity and duration, topography, presence of snow, and the rapidity of weather changes. The area most prone to flooding in Valley County is the Milk River Valley. History indicates that major flooding by the Milk River in Valley County has been primarily the result of rapid snowmelt on frozen ground during spring breakup, accelerated by chinook winds. Also affecting flooding is warm weather that progresses from west to east and north, which tends to augment flood peaks at the downstream end of the Milk River at Glasgow. A large amount of rainfall over a short time span can result in flash flood conditions (***Plan Section 3.1.4***), as well as river flooding ice jams.

Ice jam floods arise when frigid air masses linger over the lower elevations of the Milk River, while southern tributaries in the higher elevations of the Bears Paw and Little Rocky Mountains thaw. The warmer tributary streams then flow into the lower and still frozen mainstem Milk River, producing ice jam flooding. Ice jam floods frequently produce locally higher flood levels than free flowing floods. The early season March floods have historically resulted in more ice jam flooding than the April floods. Spring ice jam flooding on the Milk River is among the most frequent in the continental United States (MRIA *et al,* 1998). Although specific damage figures are not available for northeast Montana, it is estimated that ice jams cause over $100 million in damages annually in the United States (White and Eames, 1999).

Twenty-two floods have occurred over the past 100 years in the lower Milk River, south of the U.S.-Canadian border. Eighteen of these flood events were the result of rapid snowmelt and four were due to warm season thundershowers. Rapid springtime snowmelt has been responsible for the largest floods in the Milk river drainage (MRIA *et al,* 1998).

3.1.1.1 <u>Location and Extent of Previous Flood Events</u>

Several municipalities in Valley County are located wholly or partially in the alluvial floodplain of the main stem or tributaries of the Milk River. Some of the towns have constructed flood protection works that provide partial protection from overflow. The existing works have not been adequate to provide complete protection against the probable maximum flood, and heavy losses usually occur during or following periods of excessive rainfall or snowmelt. Municipalities that suffer the greatest damage are

Glasgow and Nashua. Flood damage has also occurred in several small towns including Hinsdale, Tampico and Vandalia.

Glasgow is located on the north bank of the Milk River just below the mouth of Cherry Creek. Cherry Creek flows along the west side of the town. Glasgow is subject to overflow from both Cherry Creek and Milk River floods.

Nashua is located on the Milk River a short distance above the mouth of Porcupine Creek. The Milk River flows along the south side of town, and Porcupine Creek enters the northeast part of the city limits. Overflows at Nashua during excessive floods have originated from both streams. A low levee about 1,000 feet in length was constructed along Porcupine Creek to protect Nashua in 1922. However, the levee has not been maintained and is not of sufficient height to provide complete protection from Porcupine Creek overflow. In 1952, spring flows at Nashua were recorded at 45,300 cubic feet per second. This flood was equivalent to a 100-year flood event for Nashua (MRIA *et al,* 1998).

Valley County received three disaster declarations for flooding; one in March 1986, one in October 1986, and the other March 12, 1997. A summary of major flood-events in the region are discussed below:

March 1939 – One of northern Montana's most severe floods. Snowmelt from unseasonably warm weather resulted in the Milk River topping its banks at Hinsdale. Within two days, floodwater threatened the Glasgow flood dike. Two days later, the river went out of bank at Nashua. A wall of water from a broken dam inundated the north side of Nashua as Porcupine Creek topped its banks. (*Red Cross Disaster Head Estimates 150 Families Need Help*, Glasgow Courier, March 30, 1939.)

April 1952 – The flood of 1952 is the flood of record for the Milk River valley. April runoff from record winter snow accumulations caused severe flooding that extended the complete length of the Milk River and most tributary streams. This flood established the record peak flow and discharge figures for the Milk and many of its tributaries, and met or exceeded the 100 year flood values for Havre and all the communities downstream. Failure of the Frenchman dam contributed to the floodwaters at Glasgow and Nashua. The 1952 flood inundated the land for nearly three weeks in the Milk river drainage. Damage estimates were placed at $6.6 million, which is equivalent to $44.1 million in 2001 dollars adjusted for inflation (MRIA *et al,* 1998).

April 1978 – Major flooding along the Milk River at Glasgow. Ninety feet of railroad spur west of Glasgow was washed out releasing a surge of water. A sharp rise in floodwater at Nashua was caused by the washout of a small bridge west of town. (*Lowland Residents Keep Eyes on Flood Waters*, Glasgow Courier, April 6, 1978.)

March 1979 – The next year, another flood hit the Glasgow area. Snowmelt created by a fast warm-up period pushed floodwater into the Milk River Valley. At the peak of the flood, the weather turned cold enough to freeze the entire floodplain with 1½ inches of ice, which was followed by 3 inches of snow. (*Flood Depth Tops Last Year*, Glasgow Courier, March 29, 1979.)

March 1986 – Flooding along the Milk River was the result of heavy snow pack and a series of warm days compounded by ice jams causing rapid changes in the river level. A federal and state disaster was declared. (*Milk River Threatens Severe Flooding Here*, Glasgow Courier, March 6, 1986.) Damage estimates from the 1986 floods exceeded $161,364, which is equivalent to $259,000 in 2002 dollars adjusted for inflation. Most of the damage was to road systems in the form of surfaces, culvert and embankment washouts and bridge repair. Debris removal was necessary in the town of Nashua as was sewer cleaning, and replacement of damaged equipment at a storm sewer lift station and sewer lagoon. (Governor's Papers, April 10, 1986, Montana Historical Society Archives.)

October 1986 – Heavy rain swelled creeks and rivers to the highest levels in memory. Western Valley County experienced extensive flooding of Beaver and Larb creeks and the Milk River resulting in extensive damage and loss. Heavy flooding was experienced on Willow and Brazil Creeks as rainwater made its way to the Milk River. A federal and state disaster was declared. (*Heavy Rains Bring September Flooding,* Glasgow Courier, October 2, 1986.)

March 1997 – Warm temperatures causing snowmelt forced the Milk River past flood stage. In anticipation of the imminent flooding forecast, the communities of Frazer and Nashua were identified with a significant potential for flooding. A federal and state disaster was declared. (*Milk River Rising, But No Evacuations Ordered in Area Yet,* Great Falls Tribune, March 27, 1997.)

3.1.1.2 Valley County Flood Hazard Mitigation Plan

Valley County currently has a Flood Hazard Mitigation Plan (Valley County, 2001). A copy of this document is contained in ***Appendix C***. The Flood Hazard Mitigation Plan describes detailed and approximate floodplain mapping for areas within Valley County. Detailed floodplain mapping was completed for an area around Glasgow and includes a 41-mile channel reach (13.5 flood plain miles) on the Milk River, a 16-mile channel reach (7.0 flood plain miles) on Cherry Creek, a tributary of the Milk River, and a 3.5-mile channel reach (2.25 flood plain miles) on East Fork of Cherry Creek. This study was completed by the Montana Department of Natural Resources and Conservation (DNRC) in July 1984, and is entitled *Flood Plain Management Study, Milk River and Cherry Creek near Glasgow*.

Approximate flood hazard boundaries were mapped by the Federal Insurance Administration of the U.S. Department of Housing and Urban Development (HUD). These maps, dated February 21, 1978, were updated effective January 1, 1987. According to the Valley County Flood Hazard Mitigation Plan (FHMP), the HUD maps lack detail and are sometimes inaccurate; however, most flood hazard areas in the County are mapped.

Publicly owned property damaged by flooding has consisted mainly of bridges, culverts and roads. According to the FHMP, many of the culverts installed to replace damaged or washed out bridges were undersized to accommodate floodwater. High water also caused many roads to wash out (several roads in Valley County are in the floodplain due to necessity). Flood damage also included land subsidence due to excessively wet soil.

According to the FHMP, records were not kept until recently for publicly owned facilities that required repair due to flood damage. ***Table 3-2*** presents a summary of dollars spent to repair public property damaged from flooding in Valley County.

TABLE 3-2 PUBLIC PROPERTY DAMAGE FROM VALLEY COUNTY FLOODS		
Year	**Total Damages**	**Inflation Adjusted Dollars (2002)**
1952	$775,346	$5,166,736
1978	$75,261	$214,829
1979	$57,146	$151,599
1986	$237,454	$381,062
1997	$76,406	$84,354
Source: Valley County Flood Hazard Mitigation Plan (2001) Inflation Adjustor http://www.westegg.com/inflation/		

The FHMP indicates that flood damage to private property has consisted primarily of river and stream bank erosion where acres of land have been lost. Other damage has included flooded basements due to high groundwater resulting from the flood sources staying at flood stage for an extended period, or from higher than normal groundwater. Many wells were contaminated as a result of high groundwater. Private bridges were damaged. There were a number of cases of land subsidence. There were also agricultural losses to livestock and cropland. Damage estimates for privately owned property is very difficult to estimate due to the fact that most people cleaned up the damage without keeping track of dollar figures. The exact dollar figure related to erosion damage is also difficult to determine. Ten properties in the Glasgow area have sustained repetitive losses from flood damage.

Valley County is enrolled in the National Flood Insurance Program (NFIP), which encourages the principles of floodplain management. In return for the availability of flood insurance, Valley County has agreed to adopt and administer a floodplain management program that manages new development in 100-year floodplains.

3.1.2 Winter Storms

Winter storms and blizzards follow a seasonal pattern that begins in late fall and lasts until early spring. These storms have the potential to destroy property, and kill livestock and people. Winter storms may be categorized as sleet, ice storms or freezing rain, heavy snowfall or blizzards, and low temperatures. Blizzards are characterized by low visibility caused by high winds and blowing snow. Storm type definitions are presented in ***Table 1-2***.

A severe winter storm is generally a prolonged event involving snow or ice and extreme cold. The characteristics of severe winter storms are determined by the amount and extent of snow or ice, air temperature, wind speed, and event duration. Severe winter storms create conditions that disrupt essential regional systems such as public utilities, telecommunications, and transportation routes. Ice storms accompanied by high winds can have destructive impacts, especially to trees, power lines, and utility services.

Winter storms are frequently the precursors to spring flooding; the more snow, the better the chances of floods if a quick warm-up occurs. Any snowfall over 4 inches is likely to have an effect on both property and lives in Valley County as snow frequently combines with winds in northeast Montana to produce blizzards. The NWS reports that at least three lives have been lost due to extreme cold in northeast Montana.

3.1.2.1 Location and Extent of Previous Winter Storm Events

Severe winter storm events affect northeastern Montana and impact Valley County residents on a regular basis. ***Table 3-3*** presents the winter weather listings from the NWS Storm Events Database (***Appendix G***). Storm type definitions are presented in ***Table 1-2***.

TABLE 3-3
NWS STORM EVENTS DATABASE
WINTER WEATHER LISTINGS IN VALLEY COUNTY

Date	Type	Comments
11/10,18 & 12/16-29/1996	Blizzard, Extreme Cold, Winter Storm & Heavy Snow reports	
1/18-28 & 3/12 1997	Extreme Windchill, Blizzard & Winter Storm reports	1 death
3/9,23 1998	Winter Storm, Heavy Snow	
12/4,29 1998	Heavy Snow, Winter Storm	
5/11 1999	Heavy Snow	
4/13 2000	Winter Storm	
11/5 & 12/15,27 2000	Winter Storm, Blizzard, Ice Storm reports	$3.3M in property damage
5/7 2002	Winter Storm	

A synopsis of some of the severe winter storms that have affected the area, as chronicled by local newspapers, is presented below. In addition to those described below, a 1986 winter storm in Valley County was declared a State disaster.

February 1923 – Temperatures dropped from 32 below to 47 below in northeast Montana during the worst blizzard in years. (*Terrible Blizzard Rages for 2 Days*, Valley County News, February 16, 1923.)

February 1933 – North wind brought snow, which made travel impossible. Temperatures dropped to 44 below zero. Power outages occurred when wind snapped utility poles. (*Mercury Goes to 40 Below; Strong Gale Adds to Discomfort*, Glasgow Courier, February 10, 1933.)

February 1947 – A winter storm struck Valley County with intensity and speed that caught many unprepared. The accompanying 32 mph wind and zero visibility on the highway stranded many motorists. A bad spot was Kintyre flat between Nashua and Frazer, where several stranded motorists narrowly escaped freezing. In Opheim the blizzard was described as “blinding and suffocating”. (*Short, Swift Blizzard Strikes; Entire County Locked in Storm*, Glasgow Courier, February 5, 1947.)

March 1951 – The winter storm of 1951 stands as one of the most severe to hit Valley County. Wind gusts of 55 and 60 mph caused zero visibility due to blowing snow. Motorists were stranded due to blinding conditions that caused them to drive off highways into ditches. (*Big Storm Finds Many Marooned*, Glasgow Courier, March 22, 1951.)

February 1952 – A severe storm hit Valley County, blocking roads and causing electric power interruptions due to high wind and heavy snowfall. The storm claimed the lives of three persons in Opheim who were found frozen in deep drifted snow. (*Three Dead Near Opheim, After Week End Snow Storm; Storm Causes Power and Road Trouble*, Glasgow Courier, February 21 and 22, 1952.)

February 1978 - Wind whipped snowdrifts more than nine feet high, isolated farm and ranch families and blocked most roads. No lives were in danger but the livestock industry approached a state of emergency. There was zero visibility throughout the County with wind up to 45 mph. The wind chill factor was 36 below. The blizzard continued for a week without letting up. The State of Montana declared Valley County a disaster. (*Storm Grips Area*, Glasgow Courier, February 9, 1978.)

November 2000 – Valley County was hard hit by the severe winter storm declared a federal disaster in Sheridan, Daniels, and Roosevelt Counties. A summary of the letter sent to President Clinton by Governor Racicot is presented below:

"On October 31, 2000 a rainstorm hit northeast Montana. The storm started as a drizzle, however, by the early morning hours of November 1, 2000 it had turned into snow and sleet. The storm produced wind gusts of 30 to 40 mph, temperatures reaching 35 degrees below zero and snow drifts up to 3 and 4 feet deep. The initial storm was followed by additional and intermittent storms across eastern Montana. These combined storms represent the earliest and heaviest snows ever-recorded in portions of northeastern Montana."

"A winter weather event of this magnitude has a substantial impact on the commercial, municipal, residential, and agricultural arenas. The biggest impact commercially was on the electrical co-ops, which serve the rural areas. Freezing temperatures followed the rainstorm, causing ice to accumulate on power lines. The weight of the ice was so tremendous that it snapped power lines and broke poles. Overall, electrical co-ops lost upwards of 895 power poles, which affected over 6,500 customers. The power outages ranged between 12 hours up to 3 weeks in some areas."

"Vital water pumps were among the losses caused by the power outages. Therefore, municipalities suffered the loss of fire suppression along with a depletion of town emergency water supplies, causing local government to restrict citizens to an 'Emergency Only' water ration. State snowplows had to work 20 hours a day for snow removal in 'Emergency Only' travel conditions."

"Residents lost electricity, which negated their personal wells and threatened their major heat source. The amount of snow and ice was so immense that the weight collapsed roofs causing major structural damage."

3.1.3 Wildfire

A wildfire is an unplanned fire, a term which includes grass fires, forest fires and scrub fires be it man caused or natural in origin. Severe wildfire conditions have historically represented a threat of potential destruction within Montana. Negative impacts of wildfire include loss of life, property and resource damage or destruction, severe emotional crisis, widespread economic impact, disrupted and fiscally impacted government services, and environmental degradation.

Wildland/urban interface is defined as the zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuel. In northeast Montana, the wildland/urban interface typically is where the edge of local communities adjoin agricultural fields, many of which are in CRP.

U.S. Forest Service (USFS) data for 1990 indicate that 25.7 percent of reported wildfires were caused by arson. Other ignition sources were debris burns (24 percent); lightning (13.3 percent); and other (16.7 percent). Lightning can present particularly difficult problems when dry thunderstorms move across an area suffering from seasonal drought. Local residents have indicated that the railroad is a common ignition source of wildfires in northeastern Montana; however, this is not admitted by the railroad.

Multiple fires can be started simultaneously by the railroad, as is often the case in northeast Montana. In dry fuel areas, these fires can cause massive damage before containment. Dry grass, associated with farmland in CRP, is the primary fuel for northeast Montana wildfires. The rate of spread of a fire varies directly with wind speed. Numerous wildfires have impacted residents in northeast Montana. The generally windy conditions typical to the region as noted in ***Plan Section 1.4*** cause wildfires to spread rapidly as happened with the Halloween fires of 1999, described below.

3.1.3.1 Location and Extent of Previous Wildfire Events

Wildfires in 1994 and 1999 were declared State and/or Federal disasters. A description of some wildland fires that have occurred in northeast Montana is presented below.

Oswego Fire - September 11, 1971 – A raging prairie fire consumed 15,000 acres and burned the town of Oswego, in Valley County. Thirteen occupied homes were completely destroyed, along with several other vacant buildings, one of the town's two grain elevators, and a highway bridge. The local utility company suffered losses when many of their poles burned and downed electrical wire. The grass fire burned over 2.8 miles of railroad ties on Burlington Northern's tracks. The source of the fire started at the town's garbage dump where near hurricane force winds blew sparks into a haystack. The fire in Oswego was not the first that town had suffered. Twice in its history prairie fires decimated the town of Oswego, the last large one was about 1922. At the same time as the Oswego fire, a grass fire in the Wolf Creek area burned thousands of acres. The fire was set by dry lightning. (*Flames Gut Oswego; Aid Coming*, The Herald News, September 16, 1971.)

Bainville Fire - June 1988 – A range fire south and east of Bainville, in Roosevelt County, started along the Burlington Northern railroad tracks, destroyed two homes, a County bridge and burned an area 2½ miles wide and eight miles long. (*Range Fire Destroys Farms*, Wolf Point Herald, June 16, 1988.)

The Pines Fire - August 1, 1998 – A fire pushed by 40 mph wind threatened cabins in the Pines recreation area on Fort Peck Reservoir, in southwestern Valley County. The fire was human-caused and began near the Pines Youth Camp facility. It burned approximately 1,250 acres in a heavily timbered area. A number of residents were threatened *(Weekend Blaze in the Pines Recreation Area,* Wolf Point Herald News, August 6, 1998.)

Murray Fire – August 6, 1999 – Firemen from Reserve, Medicine Lake and Plentywood battled a 100-acre wheat field fire about six miles northwest of Reserve, in Sheridan County. Combining was in progress and equipment malfunction caused heat or sparks that ignited the field of ripe grain. (*Fire Consumes 100 Acres; Burning Ban is Approved*, Sheridan County News, September 1, 1999.)

Culbertson Fire – October 24, 1999 – North of Culbertson, a pickup truck started a grass fire that was then spread by 20 mph winds. Approximately, 720 acres were charred in a 4-mile long by 1½-mile wide area. (*October 24 Prairie Fire Burns 720 Acres North of Culbertson,* Culbertson Searchlight, October 28, 1999.)

Outlook Fire - October 31, 1999 – A massive, wind-fueled wildfire swept across the prairie and about 20 buildings, including 3 inhabited homes, the post office, and gas station, and three grain elevators burned to the ground. At times, the blaze spread as fast as 40 mph. When the fire was finally contained it had burned a swath a mile wide and 15 miles long. The fire began about eight miles west of Outlook along the Soo Line railroad tracks, in Sheridan County. Officials said sparks from a passing locomotive set fire to the grassy right-of-way and wind gusts up to 60 mph blew it out of control. Damage to the railroad was $750,000, including a destroyed locomotive, damaged railcars, charred railroad ties, and two obliterated wooden rail bridges. (*Families Return to Burned Homes*, Great Falls Tribune November 2, 1999.) Farmers and ranchers lost livestock, forage, fences, equipment and other real property. The NWS reported 18,000 acres burned and $4 million in damages. (*Halloween 1999 Firestorms*, NWS Power Point Presentation.)

Wolf Point Fire - October 31, 1999 – A grass fire started three miles east of Wolf Point and burned east toward Poplar, cutting a four-mile wide swath. It jumped the Missouri River and into McCone County. Firefighters were battling wind ranging from 40 to 60 mph. Rural structures were burned including six homes southeast of Wolf Point and the local UPS building where a two-building complex and six trucks were destroyed. Damage was estimated between $4 and $5 million. (*Wolf Point Families Homeless*, Great Falls Tribune, November 2, 1999.) The NWS reported that 8,000 acres burned (*Halloween 1999 Firestorms*, NWS Power Point Presentation.)

Antelope Fire - October 31, 1999 **–** The ferocious wind that spread the Outlook fire also sent a power line to the ground southwest of Antelope, in Sheridan County. The blaze grew in rough coulees and spread rapidly in high wind. Firemen battled to save structures in the Antelope area but one occupied residence was lost. The fire burned an area 7-miles by 2-miles wide. *(Fires Ravage County*, Sheridan County News, November 3, 1999.)

3.1.4 Severe Thunderstorms

The NWS estimates that over 100,000 thunderstorms occur each year in the U.S. Approximately 10 percent are classified as severe. Thunderstorms can produce deadly and damaging tornadoes, hailstorms, intense downburst and microburst wind, lightning, and flash floods. Thunderstorms spawn as many as 1,000 tornadoes each year. Since 1975, severe thunderstorms were involved in 327 Federal disaster declarations.

Hailstorms develop from severe thunderstorms. Hailstorms are frequent during the summer months in northeast Montana and the most common severe weather category in Valley County. Nationally, hailstorms cause nearly $1 billion in property and crop damage annually, as peak activity coincides with peak agricultural seasons. Severe hailstorms also cause considerable damage to buildings and automobiles, but rarely result in loss of life. NWS data indicate 150 hail reports in Valley County over the 52 year period of record, with the largest hailstones at 4.5 inches diameter falling July 21, 1999 in the Glasgow area.

Severe thunderstorms can produce damaging straight-line winds in excess of 58 mph. High winds associated with thunderstorms affect areas with significant tree stands, as well as areas with exposed property, major infrastructure, and aboveground utility lines.

Tornados are the most concentrated and violent storms produced by the earth's atmosphere. They are created by a vortex of rotating wind and strong vertical motion, which possess remarkable strength and can cause widespread damage. The most violent tornadoes are capable of tremendous destruction with wind speeds of 250 mph or more. Northeast Montana experiences tornadoes, many of which produce significant damage and occasionally injury or death. Over the 52 year period of record from the NWS, 37 (***maybe only 18***) tornadoes have been confirmed in Valley County.

3.1.4.1 Location and Extent of Previous Severe Thunderstorm Events

Numerous severe thunderstorms, hail, and tornado events have affected northeastern Montana. ***Table 3-4*** presents the severe summer storm listings from the NWS Storm Events Database (***Appendix G***). Storm type definitions are presented in ***Table 1-2***.

TABLE 3-4
NWS STORM EVENTS DATABASE
SEVERE SUMMER WEATHER LISTINGS IN VALLEY COUNTY

Location	Date	Type	Comments
Valley County	7/9/1954	Tornado	
Valley County	7/5/1955	Hail	1.25-inch diameter hail
Valley County	6/28 & 7/16 1956	Hail & 2 Thunderstorm wind reports	0.75-inch diameter hail
Valley County	8/5,10,19/1957	2 Hail & 1 Thunderstorm wind report	1.25- to 2-inch diameter hail
Valley County	6/18 & 7/12 1958	4 Hail & 1 Tornado report	1- to 1.25-inch diameter hail
Valley County	6/9/1959	Hail	0.75-inch diameter hail
Valley County	8/4/1960	Hail	1.75-inch diameter hail
Valley County	6/20 & 7/30 & 8/18 1961	3 Thunderstorm wind reports	60 to 72 kts,
Valley County	6/20 & 8/4 1962	Hail, Tornado	0.75-inch diameter hail; $250K property damage
Valley County	6/14,20-21,27-28 & 7/5,10 & 8/25 1963	3 Hail & 8 Thunderstorm wind reports	0.75- to 1.75-inch diameter hail; Winds 57 to 80 kts.
Valley County	7/18 & 8/1 1964	3 Hail reports	1.75- to 2-inch diameter hail
Valley County	6/18/1965	Hail	0.75-inch diameter hail
Valley County	7/7/1968	Thunderstorm wind	60 kts,
Valley County	8/6/1970	Tornado	
Valley County	6/23/1971	Hail	2-inch diameter hail
Valley County	6/11/1972	2 Tornado reports	$3K property damage
Valley County	7/7/1974	2 Thunderstorm wind reports	56 to 69 kts,
Valley County	6/25 & 7/29 & 8/7 1975	4 Thunderstorm wind & 3 Tornado reports	54 to 60 kts,; $25K property damage
Valley County	6/9/1976	Hail	0.75-inch diameter hail
Valley County	6/9 & 7/2,4 1978	2 Thunderstorm wind & 1 Tornado report	52 to 58 kts,
Valley County	5/25/1980	Thunderstorm wind	62 kts,
Valley County	7/31/1981	Thunderstorm wind	58 kts,

TABLE 3-4
NWS STORM EVENTS DATABASE
SEVERE SUMMER WEATHER LISTINGS IN VALLEY COUNTY

Location	Date	Type	Comments
Valley County	7/10,19/1983	2 Thunderstorm wind & 1Tornado report	76 kts,; $3K property damage
Valley County	7/22/1987	Hail	0.75-inch diameter hail
Valley County	5/6,30 & 6/29 & 7/4-5 & 8/18 1988	12 Thunderstorm wind & 5 Tornado reports	55 to 80 kts,
Valley County	6/19 & 8/7,18 1989	4 Thunderstorm wind & 1Tornado report	52 to 63 kts.
Valley County	6/27-28/1990	2 Hail reports	0.75 to 1.25-inch diameter hail
Valley County	7/4,17 & 8/4 1991	3 Hail reports	0.75 to 1.75-inch diameter hail
Valley County	8/6/1992	4 Hail reports	1-inch diameter hail
Glasgow, Fort Peck, Lustre	8/15-16/1993	2 Hail & 5 Thunderstorm wind reports	1- to 2.5-inch diameter hail; $560K property damage & $55K crop damage Glasgow; $5K property damage Fort Peck & Lustre
Hinsdale, Glasgow	8/16, 21/1993	2 Flash flood reports	$500K property damage & $500K crop damage (Hinsdale); $50K property damage & $5K crop damage (Glasgow)
Glasgow	6/7 & 7/18 1994	Hail & Thunderstorm wind	1.25-inch diameter; $505K crop damage
Fort Peck, Glasgow, Nashua	6/6,22 & 8/26 1995	Hail, 2 Tornado reports & 2 Flash flood reports	3-inch diameter hail; $6K property damage
Glasgow, Nashua, Richland, Lustre, Hinsdale, Glentana, Frazer, Oswego	5/13 & 6/3,9,11,14,16,17,24 & 7/27 1996	18 Hail, 1 Tornado, 1 Flash flood, & 6 Thunderstorm wind reports	0.75- to 1.5-inch diameter hail; Winds 52 to 61 kts.
Wheeler, Glasgow, Fort Peck, Hinsdale, Nashua, Frazer, Opheim	6/29 & 7/6,17,23 &, 8/2,28 1997	10 Hail reports	0.75- to 1-inch diameter hail; $52K property damage Fort Peck
Hinsdale, Lustre, Glasgow, Ft Peck, Frazer, Oswego	6/6, 26, 29 & 7/17 & 8/14, 28 1997	25 Thunderstorm wind & 1 Tornado report	Winds 50 to 100 kts.; $13K property & crop damage Hinsdale; $140K property damage Glasgow; $10K property damage Frazer; $1K property damage Fort Peck
Frazer, Opheim, Glasgow, Hinsdale, Larslan, Ft Peck, Lustre	5/27 & 6/23 & 7/1,4-6,11,18 & 8/1,17 1998	17 Hail & 9 Thunderstorm wind reports	0.75- to 1-inch hail; Winds 52 to 66 kts.; $10K property damage Glasgow (wind)
Opheim, Glasgow, Ft Peck, Glentana, Hinsdale, Nashua, Frazer, Tampico, Vandalia, Oswego	6/8,21,25 & 7/7,12,21,24 & 8/13 1999	17 Hail, 10 Thunderstorm wind, 1 Flash flood & 4 Tornado reports	0.75 to 4.5-inch hail; Winds 52 to 80 kts.; $1.55M property damage & $200K crop damage Glasgow; $58K property damage Ft Peck (wind); $253K property damage Opheim (wind)
Hinsdale, Lustre, Nashua, Vandalia, Glasgow, Larslan, Frazer, Park Grove, Oswego, Glentana, Opheim,	6/7-9 & 7/2-10, 21 & 8/1,11 & 9/4 & 10/1 2000	42 Hail, 15 Thunderstorm wind, 2 Flash flood & 4 Tornado reports	0.75- to 3-inch hail; Winds 50 to 71 kts.; $260K property damage & $100K crop damage Glasgow; $110K property crop damage Hinsdale; $200K property & crop damage Opheim

TABLE 3-4 NWS STORM EVENTS DATABASE SEVERE SUMMER WEATHER LISTINGS IN VALLEY COUNTY			
Location	**Date**	**Type**	**Comments**
Glasgow, Hinsdale, Nashua, Frazer, Beaverton, Opheim, Ft Peck, Oswego	6/9,15,25 & 7/1,10-12,20-28 & 9/19 2001	19 Hail, 15 Thunderstorm wind & 2 Flash flood reports	0.75 to 1.75-inch hail; 51 to 84 kts.; $200K crop damage Hinsdale; $55K property damage Glasgow
Glasgow, Ft Peck, Vandalia, Tampico, Opheim, Oswego, Hinsdale, Park Grove	5/28 & 6/22,29 & 7/4,8-16,24 & 8/6,16, 20-30 & 9/3,5 2002	10 Hail, 29 Thunderstorm wind & 3 Tornado reports	0.75 to 1.75-inch hail; Winds 50 to 83 kts; $135K property damage Hinsdale; $110K property damage Park Grove
South portion of County	8/21/2002	Flash flood report	$20K property damage

A brief synopsis of severe thunderstorm, hail, and tornado events in northeast Montana, as chronicled by local newspapers, is presented below.

August 1906 – A disastrous hail and windstorm struck Nashua and vicinity and did tremendous damage. All the north and west facing windows in town were demolished by hail and a few buildings were blown down. All the crops were entirely destroyed. (*Destructive Storm*, Glasgow Courier, August 10, 1906.)

July 1923 – A northern Valley County storm killed a young man when he was struck by lightning near Glentana. The storm assumed the nature of a tornado and proceeded to damage crops as well as buildings. The Sheriff reported that 128 houses, barns and granaries were wrecked by the storm. (*Bad Storm Does Much Damage*, Valley County News, July 27, 1923.)

August 1935 – A severe rain and hailstorm swept the Hinsdale area. The storm, estimated to be 17 miles wide, mowed down all standing crops and gardens. Because of the terrific wind that accompanied it, buildings were twisted around or blown away. Turkeys and chickens were either drowned or killed by hail. (*Hail, Wind Storms Cause Damage in North Bench Area*, Glasgow Courier, August 1, 1935.)

August 1953 – A violent storm struck a six or seven square mile area southwest of Glasgow causing severe hail and wind damage. The tornado-strength wind caused crop damage and damage to several structures. A metal granary was blown over and a frame granary was torn off its foundation landing in a field about 50 yards away. A garage made of railroad ties was completely destroyed. (*Storm Causes Hail, Tornado Damage*, Glasgow Courier, August 13, 1953.)

April 1955 – A rainstorm followed by high wind snapped off 96 poles (about three miles) between Opheim and the nearby Air Force radar station. Moisture froze on the wires and the extra weight along with a strong wind caused the severe damage. A "crack the whip" motion snapped the poles, then flipped them over. (*96 Poles Down in Rain-Wind Storm*, Glasgow Courier, Opheim, April 7, 1955.)

July 1956 – A severe hailstorm damaged 75 to 100 percent of the crops in Valley County. Hailstones as big as golf balls flattened crops, gardens and killed young geese and poultry. (*Heavy Losses Left In Wake of Hailstorm Sweeping N. Country*, Glasgow Courier, July 5, 1956; *Hail Sweeps Area North of Tampico*, Glasgow Courier, July 12, 1956.)

June 1962 – A violent rainstorm with considerable hail struck Glasgow and deposited ½-inch of moisture in 45 minutes. Wind was recorded as high as 70 mph and hailstones measured ¾ inch near the airport. The wind blew down large signs and broke power lines. Some of the heaviest damage was in Frazer and Oswego. Damage to buildings in Glasgow was serious and consisted of broken windows and damaged shingles and siding. (*Violent Storm Strikes City*, Glasgow Courier, June 21, 1962.)

August 1962 – A violent tornado struck the Opheim area, wrecking buildings, uprooting trees and tearing down power and telephone lines in several areas. The roof and siding were blown off a lumberyard and a steel granary blew into a home, breaking windows. A hangar and plane at the Opheim airport was damaged when the door blew off and the tail of the plane jammed through the hangar roof. Telephone service was out for about 12 hours and some power transmission lines were out for several days. (Glasgow Courier, *Tornado, Hailstorm Strikes in North County*, August 7, 1962.)

July 1974 – Three days of vicious storms brought wind gusts of 80 mph, up to 5 inches of rain, and severe hail to the Glasgow area. (*Trio of Storms Lash County With High Wind, Rain, Hail*, Glasgow Courier, July 11, 1974.)

July 1983 – A tornado touched down in the Vandalia area, 15 miles west of Glasgow. The storm broke off 72 power poles. A large irrigation sprinkler system and three large grain bins were damaged at a local farm. Roofs and windows were damaged at several residences. (*Tornado with Hail Rips Through Vandalia Area*, Glasgow Courier, July 14, 1983.)

August 1985 – Rain and hail combined with wind peaking at 61 mph tore the roof off a portion of the Cottonwood Inn in Glasgow. Five inches of rain fell at Hinsdale during the storm. (*Wind Rips Through City Leaving Trail of Damage*, Glasgow Courier, August 8, 1985.)

August 27, 1997 – Strong thunderstorms made their way across the prairie of northeast Montana. The Port of Raymond and town of Flaxville both reported winds of 65 mph. Hail accumulated to depths of one foot in the town of Westby. Two inches of rain fell in Froid and water from the cloud burst flooded Main Street. A 93 mph gust southwest of Lustre hit southern Daniels County causing extensive property damage. A large hip-roof barn and new cattle shed were blown into shambles at a farm 20 miles southeast of Scobey. Three inches of rain were reported in southern Daniels County. *(Severe T-Storms Pound County, Other Regions,* Daniels County Leader, September 4, 1997.*)*

June 1999 – Severe weather hit northeastern Montana, north and south of Glasgow. At least three tornado sightings were reported to the NWS, with the most damage in Opheim and in the Fort Peck areas. In Opheim, the front of the Homestead Hotel & Café was partially torn off. Many power poles and lines were down, and numerous trees were uprooted. A number of agricultural buildings were also damaged. A State disaster was declared. (Gov. Marc Racicot papers, August 9, 2000, Montana Historical Society Archives.) NWS storm warnings reached the general public, emergency services, and other vitally interested authorities of northeast Montana. One glaring exception was the community of Opheim, which was struck by an F1 tornado; this location being over 50 miles from the nearest NOAA Weather Radio transmitter and out of range of overage. As a result, authorities and residents of Opheim did not receive the tornado warning in time.

3.1.5 Human-Caused and Technological Hazards

Human-caused hazards are technological hazards (accidental events) and terrorism (intentional acts). These are distinct from natural hazards primarily in that they originate from human activity.

The term "technological hazards" refers to the origins of incidents that can arise from human activities such as the manufacture, transportation, storage, and use of hazardous materials. Technological emergencies are accidental and their consequences are unintended. Examples of technological hazards are industrial accidents at either fixed facilities or transportation, and failure of a critical infrastructure component.

The term "terrorism" refers to intentional, criminal, malicious acts. Terrorism hazards include the use of Weapons of Mass Destruction, such as biological, chemical, nuclear, and radiological weapons; arson, incendiary, explosive, and armed attacks; industrial sabotage and intentional chemical releases; and "cyber terrorism".

Whether intentional or accidental, human-caused disasters involve the application of one or more modes of harmful force to the built environment. These modes are defined as contamination (chemical, biological, radiological, or nuclear hazards), energy (explosives, arson, and electromagnetic waves), or failure or denial of service (sabotage, infrastructure breakdown, and transportation service disruption). The greatest human-caused hazard risk to northeast Montana communities is the large quantities of propane, anhydrous ammonia, and petroleum stored in various locations, and the lack of security at these bulk storage facilities. Transportation of hazardous materials on highways and by railroad also poses a significant risk to the area.

3.1.5.1 Location and Extent of Previous Technological Hazard Events

Technological hazards in northeast Montana do not occur with great frequency. However, a bomb scare on the Amtrak train in Wolf Point indicates the region is not immune to terror-related hazards.

February 1996 – Amtrak offices in Philadelphia received notification by phone from a person claiming to have knowledge of a bomb placed on a train headed for western Montana. At that time, the train was 10 minutes out of Wolf Point. The decision was made to evacuate passengers from the train and to allow a search to take place. Once the train was evacuated, it was moved to the east end of town, where it was anticipated than an explosion would cause less property damage. Teams were sent from Great Falls, including a canine search team from Malmstrom and the Explosives Ordinance Disposal team from the Montana Air National Guard. No sign of explosives were found and the train was cleared to continue its journey. (Bomb Scare, Wolf Point Herald News, February 26, 1996.)

Records of human-caused disasters in Roosevelt County, available from the U.S. Coast Guard's National Response Center database, and the Montana DES Hazardous Material Response database are summarized in ***Tables 3-5*** and ***Table 3-6***, respectively.

TABLE 3-5
HUMAN CAUSED HAZARD INCIDENTS
COAST GUARD NATIONAL RESPONSE CENTER DATABASE

Incident Date	City	Suspected Responsible Company	Type of Incident	Medium Affected	Material Name
03/01/1990	Luster	Exxon USA	Pipeline	Land	Produced Water
05/24/1991	Glasgow		Unknown Sheen	Water	Oil: Diesel
06/16/1993	Glasgow		Railroad	Rail Report	
07/17/1993	Fort Peck	USA - Army Corp Of Engine	Fixed	Land	Polychlorinated Biphenyls

TABLE 3-5
HUMAN CAUSED HAZARD INCIDENTS
COAST GUARD NATIONAL RESPONSE CENTER DATABASE

Incident Date	City	Suspected Responsible Company	Type of Incident	Medium Affected	Material Name
11/19/1993	Glasgow		Fixed	Land	Oil, Misc: Motor
03/03/1994	Glasgow	Burlington Northern	Railroad	Land	Unknown Material
03/25/1995	Hinsdale		Railroad Non-Release	Rail Report	
07/16/1997	Fort Peck	Fort Peck Marina	Unknown Sheen	Water	Unknown Oil
11/27/1997	Oswego	BNSF Railroad	Railroad	Rail Report	
10/01/1999	Fort Peck	Fish, Wildlife And Parks	Mobile	Water	Oil: Diesel
06/16/2002	Nashua		Railroad	Rail Report	
01/24/2003	Glasgow	BNSF Railroad	Railroad Non-Release	Rail Report	

TABLE 3-6
HUMAN CAUSED HAZARD INCIDENTS
MONTANA DES HAZARDOUS MATERIAL RESPONSE DATABASE

Incident Date	Geographic Location	Incident Specific Information	HazMat Name	Amount
01/04/1997	Glasgow	Broken fitting on fuel filter of locomotive caused release of diesel	Diesel	100 gal
03/11/1997	1/2 mile north of Fort Peck	Flatbed trailer hydraulic line broke releasing oil onto pavement.	Hydraulic Oil	2 gal
07/16/1997	Fort Peck Reservoir	Overfill caused spillage of gasoline into lake	Gasoline	< 25 gal
06/05/1999	Fort Peck Reservoir Marina	Houseboat caught on fire at the marina spilling very little gasoline.	Gasoline	Unknown
10/01/1999	Fort Peck Dam, Marina Bay	Tractor fuel line broke spilling diesel fuel	Diesel Fuel	35 gals.
02/05/2000	National Guard Base	Report of Tritium leakage on a culminator gun. Have cleaned up and double bagged material.	Radiological	unknown
10/07/2001	BNSF rail near Nashua on siding	Coupler dragged and punctured fuel tanks on reefer cars.	Diesel	800 gallons
07/15/2002	Near Lustre	Oil battery fire, no release.	Crude oil	none
07/28/2002	Frazer School, Frazer, MT	Kids emptied 3 one quart bottles of sulfuric acid into school records	Sulfuric Acid	3 quarts
07/31/2002	Valley County Fairgrounds in Glasgow	Transformer fell over releasing 20 gallons of oil. Unknown if PCB oil, testing taking place	Transformer Oil, Unknown PCB	unknown

3.1.6 Dam Failure

According to the Montana DNRC, over 300 dams exist in northeast Montana. These dams are used for flood control, fire protection, irrigation, and stock watering. Montana DNRC classifies dams in terms of breach damage, as follows: "high" – significant loss of life and property; "significant" – no loss of life and significant property damage; and, "low" – minor property damage. The Army Corps of Engineers classifies dams in terms of failure where "high" or "Category I" would cause significant loss of life and property damage; "significant" or "Category II" would cause one or two losses of life and significant property damage; and "low" or "Category III" would cause minor property damage. Dam failure usually occurs as a secondary effect of storms or earthquakes.

The DNRC database identifies three high hazard (Category I) dams in Valley County; Fort Peck Dam on the Missouri River, and Little Porcupine Dam and Frazer Lake Dam East, on Little Porcupine Creek. According to the BIA Dam Safety Program, the Little Porcupine and Frazer Lake Dams are both inactive dams built for irrigation. They are in close proximity to one another but are separate structures.

BLM maintains a database of dams on federal land. According to their dam safety specialist, about 80 dams are located of BLM land in Valley County. Many of these are in unsatisfactory condition but all are considered "low" hazard dams and would not cause property damage if failure occurred.

3.1.6.1 Location and Extent of Previous Dam Failure Events

It is not known how many dams have failed in Montana. The following is a summary of several dam failures in northeast Montana, followed by a description of some of the Class I dams in the project area.

Frenchman Creek Dam Failure – Frenchman Creek Dam is located in Phillips County, 20 miles north of Saco. On April 17, 1952, the dam failed as a result of floodwater and exacerbated flooding in the Milk River Valley. The dam was completed in 1951 and had a storage capacity of about 7,000 acre-feet. The dam's main section was 926 feet long and about 40 feet high with a lower dike section at each side of the mid-valley main section. The west dike was purposely built a foot below the crest level of the spillway so that water could escape over it, in case of flooding. About the time the lower dike was overtopped, a breach was detected in the main section near the spillway. This was very small, but apparently widened as water ate through the dam. Three other irrigation dams are located on Frenchman Creek upstream across the international boundary near Val Marie, Saskatchewan. (*$150,000 Loss in Frenchman Dam Failure*, Glasgow Courier, April 17, 1952.)

Midway Dam Failure – The Midway dam, 40 miles northwest of Nashua, breached during the March 1939 Porcupine Creek flood when the spillway was undermined by huge floating ice cakes. The dam was built by the Indian Reclamation Service as an irrigation structure. The dam was earth fill, faced with concrete slabs with the spillway in the middle. When the dam failed, a four-foot liquid wall swept down the valley causing extensive damage. (*Nashua Hit Twice From High Water*, Glasgow Courier, March 30, 1939.)

Carrol Dam Failure – The Carrol Dam, located eight miles northwest of Plentywood, failed in July 1946 following several inches of rain in a short timeframe. There were no fatalities attributable to the dam failure but destruction was evident throughout the 15 mile valley which took the brunt of the flood. Several homes and farm buildings were destroyed. (*Two Flash Floods Hit Sheridan County*, Plentywood Herald, July 11, 1946.)

3.1.6.2 Existing Dams in the Area

Following is a description of some of the Class I dams in the area.

Fort Peck Dam in Valley County is one of six multipurpose mainstem projects on the upper Missouri River. Construction began in 1933 and the dam was completed in 1940. It is the largest hydraulically filled dam in the United States. The dam measures 21,026 feet in length with a maximum height of 250.5 feet. In addition to power generation, the water is managed for flood damage reduction, downstream navigation, fish and wildlife, recreation, irrigation, public water supply, and improved water quality. The total storage capacity of the reservoir is approximately 18.7 million acre-feet.

Box Elder Creek Dam is owned and operated by the City of Plentywood. The dam was constructed in 1963 to provide flood protection to the city of Plentywood. The 60-foot high earth dam impounds approximately 6,620 acre-feet of water when filled. According to the 1998 inspection report prepared by the Natural Resources Conservation Service (NRCS, 1998), the dam is in excellent condition and is inspected annually. The intent of the report was to improve project safety while preserving flood protection. The 1980 inspection report (CH2M Hill, 1980) recommends that a downstream warning system be developed and activated. DNRC has indicated that due to its concrete outlet, the life expectancy of the Box Elder Creek Dam is about 100 years. The dam is currently in full compliance; its "Operations Permit" is due for renewal in September 2003 which will involve a more comprehensive 5-year inspection.

Canadian Power Plant Dam, owned by the Province of Saskatchewan operates a 1,200-million watt coal-fired electric power complex in southern Saskatchewan near the international border with Montana. A strip mine, dam and reservoir for cooling water and four 300-million watt-generating stations were built in the headwaters drainage of the East Fork Poplar River, upstream of Scobey. Failure of the cooling dam structure would impact the Scobey area.

Frenchman Creek Dam, owned by the Montana DNRC, is located in Phillips County. The original dam was first completed in 1951 and failed on April 15, 1952 due to very high stream flow resulting from rapid snowmelt (see above). The dam was reconstructed in 1952-53 with a larger spillway and revisions to the seepage cutoff. Water from the Frenchman reservoir is used for irrigation, water-based recreation, and regulation of stream flow rates. DNRC ranks this dam as having a "low" downstream hazard potential.

3.1.7 Drought

A drought is an extended period of unusually dry weather. Drought is a special type of disaster because its occurrence does not require evacuation of an area nor does it constitute an immediate threat to life or property. People are not suddenly rendered homeless or without food and clothing. The basic effect of a drought is economic hardship, but it does, in the end, resemble other types of disasters in that victims can be deprived of their livelihoods and communities can suffer economic decline.

The effects of drought become apparent with a longer duration because more and more moisture-related activities are affected. Non-irrigated croplands are most susceptible to moisture shortages. Rangeland and irrigated agricultural lands do not feel the effects as quickly as the non-irrigated, cultivated acreage, but their yields can also be greatly reduced due to drought. Reductions in yields due to moisture shortages are often aggravated by wind-induced soil erosion.

In periods of severe drought, range fires can destroy the economic potential of the livestock industry, and wildlife habitat in, and adjacent to, the fire areas. Under extreme drought conditions, lakes, reservoirs, and rivers can be subject to severe water shortages, which greatly restrict the use of their water supplies. An additional hazard resulting from drought conditions is insect infestation.

3.1.7.1 Description of Previous Drought Events

The history of drought in Montana, as presented in the State of Montana Natural Hazards Mitigation Plan (DES, 2001) is summarized below.

1930's - The 1930's Dust Bowl remains the most highly publicized of past droughts in Montana, but may not necessarily be the worst.

1950's - The mid-1950's saw Montana with a period of reduced rainfall in eastern and central portions of the state. In July of 1956, four counties applied for federal disaster aid due to greatly reduced precipitation amounts since June of the previous year. By November 1956, a total of 20 Montana counties had applied for federal drought assistance.

1960's - Montana saw another drought episode in 1961. By the end of June, 17 counties had requested federal disaster designation due to lack of moisture, higher than normal temperatures, and grasshopper infestation. Small grain crops died before maturing, and range grass and dryland hay crops were deteriorating rapidly. Livestock water supplies were at critical levels. In July of 1961, the State's Crop and Livestock Reporting Service called it the worst drought since the 1930s. In 1966, the entire state experienced another episode of drought.

1980's - Another well-established drought episode occurred in eastern Montana in 1980. Glasgow received only 4.74 inches in the period from June of 1979 to May of 1980. Grasshopper infestations were seen in isolated areas, little wheat was planted, and large numbers of livestock were being sold due to the hay and water shortages. Drought-related economic losses in Montana in 1980 were estimated to be $380 million.

The drought of 1980 continued into the following year. March snowpacks were at 50-60 percent of normal, initiating forecasts of critical water shortages later in the season. Wolf Point received only six inches of precipitation in the 12-month period ending June 1979. The northeast corner of the state, where forty percent of Montana's wheat crop is produced, remained the driest area of the state.

Inadequate moisture supplies were a problem again in 1984. The seven districts involved in the Milk River Irrigation Project were out of water, and crop losses were estimated at $12 - $15 million. August of 1984 saw Montana in flames with numerous range fires burning out of control.

Drought continued to plague the state in 1985 and all 56 counties received disaster declarations. April estimates by the Montana Crop and Livestock Reporting Service put northeast Montana's pasture and range at 32 percent of normal. From 1982 through 1985, cattle herds were reduced by approximately one-third.

The continued lack of moisture in 1985 resulted in a wheat crop that was the smallest in 45 years. Grain farmers received more in government deficiency payments and insurance money than they did for their crops. For a typical 2,500 acre Montana farm/ranch, the operator lost more than $100,000 in equity over the course of that year. The state's agriculture industry lost nearly $3 billion in equity. The extended effects of this drought included the loss of thousands of off-farm jobs, the closing of many implement dealerships and Production Credit Associations.

1990's – Unusual weather conditions in northeast Montana during 1998 wreaked havoc on agricultural producers. Spring arrived late, flooding drowned alfalfa fields, and the summer was dry with rain not coming until it was too late to produce a crop. Severe winter conditions had a negative impact on the local economy, especially livestock producers. Record-setting cold temperatures occurred with snowfall in early November. Livestock feeding began two months early and required increased amounts of hay and supplemental feed. Depletion of hay supplies required that cattle be sold. The Governor requested that haying of CRP land be allowed. (Gov. Marc Racicot papers, January 15, 1997, Montana Historical Society archives).

Agricultural producers in northeast Montana faced severe adverse impacts again in 1998, due to an open winter and very little fall and spring rainfall. Both crop and rangelands were affected, but the most immediate concern was the pasture and range condition. Livestock operations had very limited feed supplies available. In many areas, native range did not green that spring, and many pastures were dormant due to the lack of rainfall and earlier high temperatures. The areas normally hayed for winter feed supplies, were also severely affected. Most areas could not be hayed at all. (Gov. Marc Racicot papers, June 8, 1998, Montana Historical Society archives).

2000's – The U.S. Department of Agriculture issued Natural Disaster Determinations for drought for the entire state of Montana for the years 2000, 2001, and 2002. This designation entitled counties to low interest loans for producers, small business administration loans, and an Internal Revenue Service provision deferring capital gains.

3.1.8 Insect Infestations

The agricultural industry in northeast Montana was particularly hard hit between 1869 and 1875 when grasshoppers completely destroyed crops. One of the most notable grasshopper invasions occurred in 1938 when "clouds of migrant hoppers came riding the wind from the southeast. They boosted populations of between 40 and 500 hoppers per square yard". Losses in the 17 counties affected by the 1938 grasshopper migration were estimated at $6,500,000 (Montana Magazine of Western History, 1985).

3.1.8.1 <u>Description of Previous Insect Infestations</u>

Insect infestations in northeast Montana resulted in State disaster declarations in 1975 and 1986. A description of previous insect infestations is presented below:

July 22, 1975 - Roosevelt County applied for State disaster assistance for abatement of mosquitoes. Assistance was requested to alleviate the infestation in livestock and recreation areas, and because of the health hazard to humans. (Letter to Governor Thomas Judge, Montana Historical Society archives).

July 26, 1975 - Valley County requested aid due to an outbreak of grasshoppers. Grasshoppers had stripped leaves from growing crops and heads from winter wheat, and had devastated gardens. The Opheim/Glentana area reported 60-70 hoppers per square yard in wheat, and the Richland/Larslan area reported 110/120 hoppers per square yard in cut hay fields. Over 40,000 acres were sprayed at a cost of over $129,000. Valley County was declared an emergency due to the plaque of grasshoppers. (Letter to Governor Thomas Judge, Montana Historical Society archives.)

3.1.9 Earthquakes

An earthquake is a trembling of the ground that results from the sudden shifting of rock beneath the earth's crust. Earthquakes may cause landslides and rupture dams. Severe earthquakes destroy power and telephone lines, gas, sewer, or water mains, which, in turn, may set off fires and/or hinder firefighting or rescue efforts. Earthquakes also may cause buildings and bridges to collapse.

Earthquakes occur along faults, which are fractures or fracture zones in the earth across which there may be relative motion. In northeast Montana, several earthquakes have been centered on the Froid-Brockton fault that runs through eastern-Roosevelt and southern-Sheridan County. Seismic risk zones are numbered 0 to 4, with a 4 representing the highest likelihood of a serious earthquake. Northeastern Montana is rated as a 0 on the Seismic Risk Zone scale.

Three quakes of magnitude 3.5 to 4.0 have been recorded in the northeastern Montana area since 1982 and one with a magnitude of 5.0 to 6.0 occurred in 1909. A magnitude 4.0 earthquake, centered about 30 miles north of Brockton, shook eastern Roosevelt County on July 28, 1998. Some residents felt the quake but no damage was reported. (*Mild Earthquake Hits NE Montana*, Daniels County Leader, August 6, 1998; *Earthquake Rocks Eastern Roosevelt County*, Wolf Point Herald, August 6, 1998.)

3.1.10 Civil Unrest

Civil unrest in not a common hazard affecting Montana; however, Garfield County made national news during the Montana Freemen crisis. In the early spring of 1996, hundreds of FBI agents surrounded the Ralph Clark ranch complex near Jordan, Montana for a total siege of 81 days. The government claimed that the nearly thirty people inside were of a radical anti-government and racist religious sect who had written bad checks and threatened judges, among other things.

3.1.11 Aircraft Accidents

The Federal Aviation Administration (FAA) has maintained a database of aircraft accidents since 1978. Database listings for northeast Montana are presented in ***Table 3-7***. No database listings for northeast Montana airports resulted in fatalities.

TABLE 3-7
NORTHEAST MONTANA AIRCRAFT ACCIDENTS FROM FAA DATABASE

Event Date	Airport Name	Aircraft Damage	Aircraft Make	Operator	Primary Flight Type	Fatalities	Injuries
11/27/02	L M Clayton/Wolf Pt	None	Fairchild	Big Sky	Commercial	0	0
09/14/00	L M Clayton/Wolf Pt	Minor	Cessna	Private	Personal	0	0
02/18/96	Wokal Field/Glasgow	Minor	Cessna	Private	Personal	0	0
10/05/95	Wokal Field/Glasgow	Minor	Swrngn	Big Sky	Air Taxi	0	0
12/29/94	Wokal Field/Glasgow	None	Swrngn	Big Sky	Air Taxi	0	0
09/18/94	Wokal Field/Glasgow	None	Swrngn	Big Sky	Air Taxi	0	0
08/20/91	Wokal Field/Glasgow	Minor	Beech	Private	Business	0	0
07/23/90	Wokal Field/Glasgow	Minor	Swrngn	Big Sky	Air Taxi	0	0
02/02/89	Wokal Field/Glasgow	None	Cessna	Big Sky	Air Taxi	0	0
04/03/88	Wokal Field/Glasgow	None	Cessna	Big Sky	Air Taxi	0	0
02/09/88	L M Clayton/Wolf Pt	None	Cessna	Big Sky	Air Taxi	0	0
10/31/83	L M Clayton/Wolf Pt	Minor	Beech	Private	Air Taxi	0	0
10/11/81	Wokal Field/Glasgow	Minor	Piper	Private	Personal	0	0

An aircraft accident involving four Plentywood residents occurred in 1962, as summarized below.

April 8, 1962 - Four Plentywood men were killed when the light plane in which they were flying crashed into a farm field about 6½ miles east of Circle Montana. According to FAA officials from Billings, a violent spring blizzard was blamed as the apparent cause of the tragedy. Authorities said the plain struck the earth at an extreme nose-low altitude with tremendous force and was completely demolished except for a potion of the tail assembly. (*Four Killed In Plane Crash*, Plentywood Herald, April 12, 1962).

3.1.12 Energy Shortage

Energy shortage is a hazard that threatens northeast Montana, as well as the entire U.S. The Arab oil embargo in 1973 and the California energy shortage of 2000 are two examples. These events are summarized below.

On October 17, 1973 OPEC imposed an oil embargo on the U.S. The embargo came at a time when 85% of American workers drove to their places of employment each day. President Nixon set the nation on a course of voluntary rationing. He called upon homeowners to turn down their thermostats and for companies to trim work hours. Gas stations were asked to hold their sales to a max of ten gallons per customer. In the month of November 1973, Nixon proposed an extension of Daylight Savings Time and a total ban on the sale of gasoline on Sunday's. A severe recession hit U.S., and gasoline lines snaked their way around city blocks (the price at the pump had risen from 30 cents a gallon to about $1.20 at the height of the crisis).

In early December 2000, the state of California was faced with the threat of rolling blackouts for several weeks because of skyrocketing electricity prices and a shortage of power supplies from out of state. The State's move to deregulate its electricity industry and the state's failure to construct new power plants was blamed for the electricity shortage.

3.2 HAZARD PRIORITIZATION

Between 1975 and the present, eight federal and/or state disasters have been declared in Valley County. Declared disasters have included three floods, two wildfires, one windstorm, one severe winter storm, and one grasshopper infestation. Further information on these disaster events is presented in subsequent sections of this Plan.

Public meetings were held in the Valley County communities of Nashua, Glasgow, Fort Peck, and Opheim. Additionally, meetings and interviews were held with public officials numerous times during development of the plan. Generally, communities located in the southern portion of Valley County identified flooding as the hazard of primary concern, followed by winter storms, wildfire, and windstorm. In Opheim, winter storms were the number one hazard identified, followed by wildfire, windstorms, and flooding. Hazards discussed and evaluated during the interviews and public meetings are presented in ***Table 3-8.***

TABLE 3-8
HAZARDS EVALUATION DURING PDM PLAN DEVELOPMENT

Natural Hazards	**Geologic Hazards**	**Hydrologic Hazards**
Thunderstorms & Lightning	Landslides	Floods
Tornadoes	Land Subsidence	Flashfloods
Windstorms	Earthquakes	Erosion
Hailstorms	Volcanic Eruption	
Severe Winter Storms	Expansive Soils	**Technological Hazards**
Avalanches		Dam Failure
Extreme Heat & Cold	**People-Specific Hazards**	Power Failure
Wildfire	Bomb Threats	Energy Shortage
Insect Infestation	Terrorism	Nuclear Accidents
	Hostage Situation	Nuclear Attacks
Biological Hazards	School/Business Violence	Fixed Site (drug labs, pipelines, refineries, USTs, etc.)
West Nile Virus	Cyber-terrorism	
Hanta Virus	Civil Disturbance	Transportation (railway, roadway, waterway, airway)
	Airplane accident	

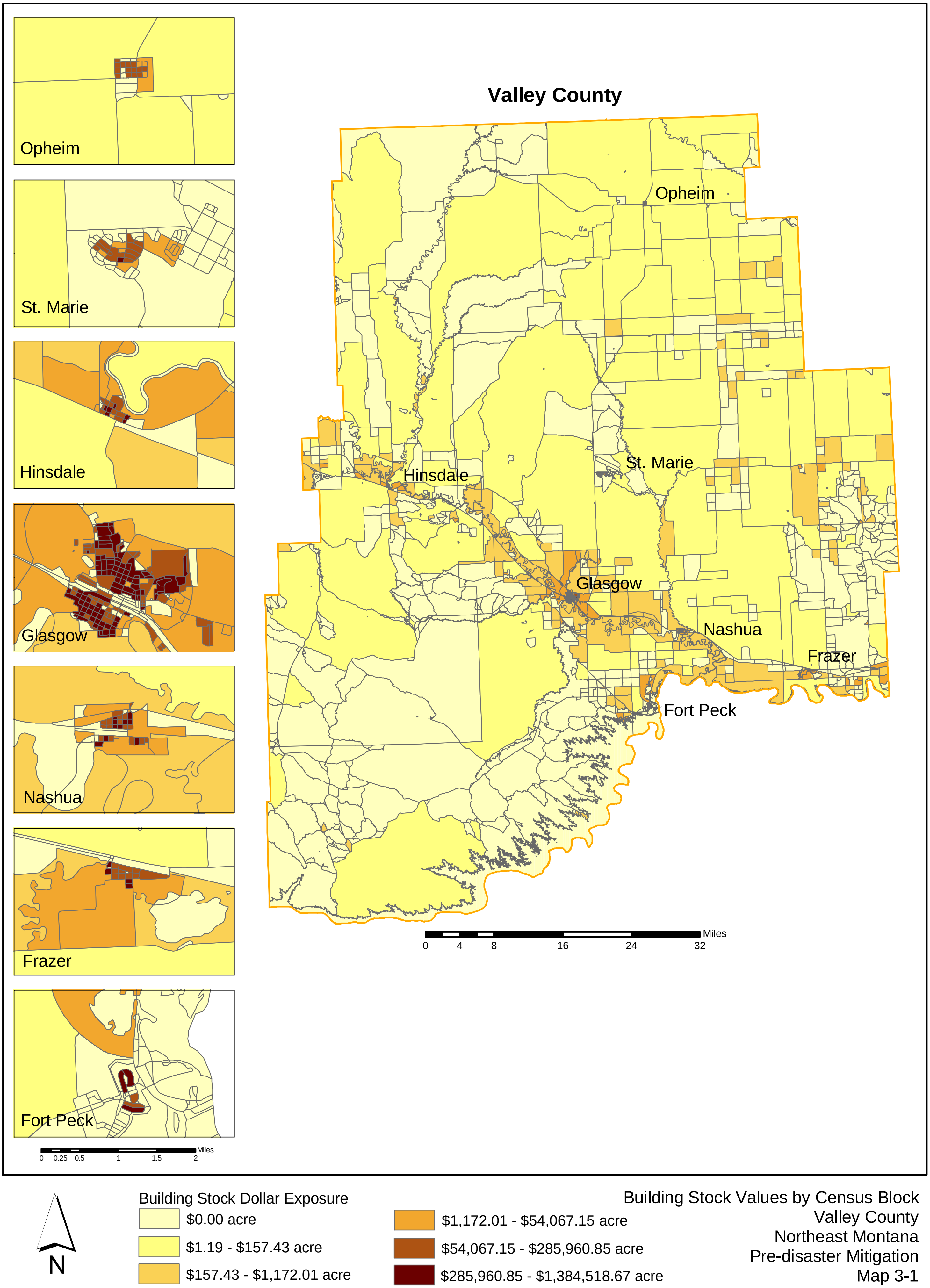
Hazard prioritization was accomplished by determining which hazards had caused prior fatalities; resulted in property damage; had the potential to cause the most economic hardship within the County; and, had the potential to affect Valley County residents in the future. Based on review of the historical record and local knowledge, Valley County identified four major hazards that consistently affect this geographic area – flooding, wildfires, severe winter storms and extreme cold, and, severe thunderstorms including high winds, hail and tornadoes. The threat of hazardous material incidents is a technological hazard present in Valley County due to transportation corridors (e.g. highway, railroad) through the area. Security of infrastructure from terrorism was also identified as a technological hazard of concern.

3.3 ASSESSING VULNERABILITY: IDENTIFYING ASSETS & VULNERABLE POPULATIONS

Assessing vulnerability requires understanding the location and importance of those things that the community values. For purposes of this risk assessment, building structural values, buildings that house critical services to the community, and people, were identified as valued community resources. To assess the vulnerability of these community assets, a model of their locations and characteristic was developed to be used in conjunction with hazard profiles for performing the risk assessment.

3.3.1 Building Values

Analysis of building stock values is based on the building stock data available from the FEMA HAZUS software. The documentation for this data is provided in ***Appendix F***. Building stock data available in HAZUS was compiled at the census track level. Due to the largely rural nature of this project area, census tracks do not provide a high enough resolution to differentiate one area from another for hazard assessment. To allow analysis of building stock values at the census block level the building stock structure values were assigned to census blocks in the same proportion that a given block represents the percentage of population in the track. ***Map 3-1*** shows building stock values by census block.



Building Stock Values by Census Block
Valley County
Northeast Montana
Pre-disaster Mitigation
Map 3-1

3.3.2 Critical Facilities and Infrastructure

Critical facilities are of particular concern because they provide, or are used to provide, essential products and services that are necessary to preserve the welfare and quality of life and fulfill important public safety, emergency response, and/or disaster recovery functions.

Critical facilities are defined as facilities critical to government response and recovery activities (i.e., life safety and property and environmental protection). Critical facilities include: 911 emergency call centers, emergency operations centers, police and fire stations, public works facilities, sewer and water facilities, hospitals, bridges and roads, and shelters; and facilities that, if damaged, could cause serious secondary impacts (i.e., hazardous material facility). Critical facilities also include those facilities that are vital to the continued delivery of community services or have large vulnerable populations. These facilities may include: buildings such as the jail, law enforcement center, public services buildings, community corrections center, the courthouse, and juvenile services building and other public facilities such as hospitals, nursing homes and schools. ***Appendix D*** lists critical facilities in Valley County.

Critical facilities data were obtained by mapping the FEMA HAZUS critical facilities data and then having the maps reviewed, corrected, and enhanced during public meetings. Accurate location information was not available for many of the critical facilities listed in ***Appendix D***. Only those facilities that could be located accurately were included in the analysis. To provide a uniform analysis, critical facilities were assigned to the appropriate census block and the block was given a score based on the number of critical facilities it contains.

3.3.3 Future Growth and Land Use Trends

Valley County has been steadily loosing population since 1960. The U.S. Census indicates that Valley County lost 6.8% of its population between 1990 and 2000. The County Planner stated that this trend is likely to continue into the future.

Agriculture plays a major role in the economy of Valley County and this trend is also not expected to change in the future. A Local Development Corporation exists to promote the growth of industry in the County and to provide assistance to entrepreneurs and small businesses. No projects are currently being considered. An economic development project taking place on the Fort Peck Indian Reservation that will provide positive impacts to portions of Valley County in the future, is described below.

Dry Prairie Rural Water System, a municipal, rural, and industrial project that will provide an adequate supply of good quality water for domestic and industrial use and for livestock water in the Fort Peck Reservation and Dry Prairie service areas. The project will consist of a water withdrawal intake and treatment plant near the community of Poplar, and pumping stations, pipelines, storage tanks, power lines, and other ancillary facilities that will serve a future population of about 30,000 people with water from the Missouri River.

Future Valley County development projects include a Special Events Center. Although local officials have indicated that there are no future buildings, infrastructure or critical facilities proposed that would be located in identified hazard areas, mitigation options will be considered in future land use decisions.

3.3.4 Vulnerable Populations

A significant factor in the impact of any hazard is the effect it has on people. The severity of the impact is related to the intensity of the hazard, the population affected, and the population's ability to protect itself. To model the ability to self-protect and recover from hazards, we used age and indicators of economic well being. The population data used to develop the vulnerability model was derived from the 2000 Census. To model overall vulnerability the following equation was used:

- Score = (societal variable for block / total societal variable in jurisdiction) / maximum societal variable for any block in the jurisdiction)

This formula creates a score for each variable that is based on the percentage of that variable in the jurisdiction and is normalized to a scale that is the same as the other variables. The societal variables that were used to determine the overall societal vulnerability per census block were:

- Population Density
- Age > 65
- Age < 18
- Income < Poverty Level
- No High School
- Population with Disabilities
- Population on Public Assistance

Each block was assigned a score for each societal vulnerability and an overall societal vulnerability by adding the individual societal vulnerability scores and dividing by seven, which is the total number of variables evaluated. ***Map 3-2*** depicts total societal vulnerability by census block.

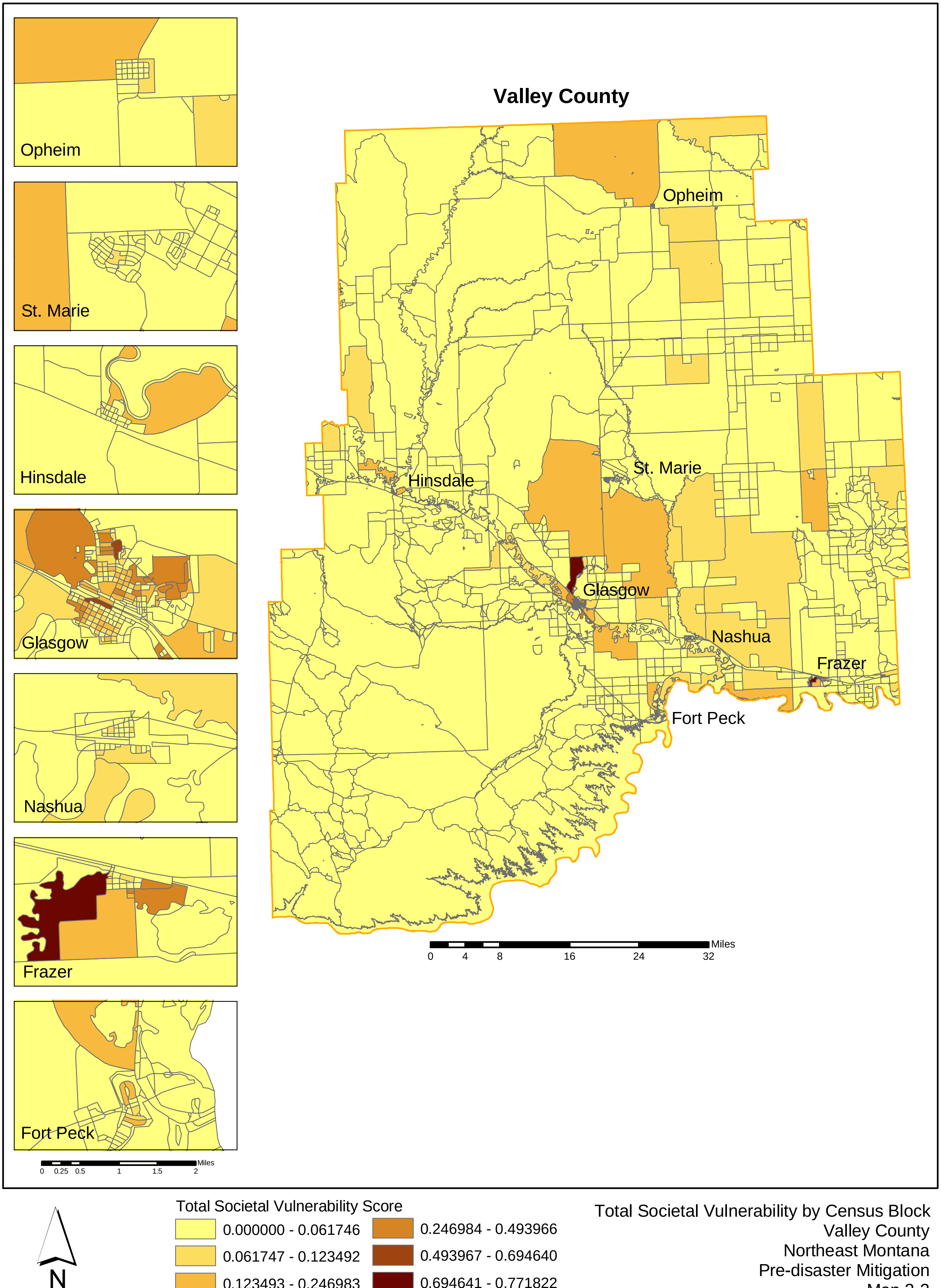
3.4 HAZARD PROFILES

Hazard profiles define the frequency, location, and intensity of hazards that may impact a community. Profiles were developed for hazards that historically have had the most effect on the community and the ones that the community identified as being of most concern during public meetings.

3.4.1 Hazard Frequency

The frequency of past hazard events was calculated to determine the probability of future hazards occurring. Accurate and consistent records have not been kept for many hazards. Where records have been kept, they are often heavily biased towards only reflecting hazards that occurred in the more populated areas of the jurisdiction. This is especially problematic in areas like Valley County that are largely rural.

Data from the NOAA National Climate Data Center Storm Events database and the Montana DES was used to compile frequencies of natural hazards. The complete listing of events from this database can be found in ***Appendix G***.



Total Societal Vulnerability by Census Block
Valley County
Northeast Montana
Pre-disaster Mitigation
Map 3-2

TABLE 3-9 VALLEY COUNTY HAZARD FREQUENCIES			
Hazard	**Number of Events**	**Period of Record In Years**	**Frequency In Years**
Flooding	15	9	1.7
Winter Storms	20	9	2.2
*Wildfire	724	8	90.5
Tornadoes	37	52	.71
Wind/Thunderstorms/Hail	357	47	7.5
**Technological	28	5	1.7
NOTES: *Compiled from data provided by DES and represents a regional frequency. ** Compiled from DES HAZMAT Response and Coast Guard National Response Center Databases			

3.4.2 Hazard Impact Areas

Hazard impact areas describe the geographic extent a hazard can impact a jurisdiction and are uniquely defined on a hazard-by-hazard basis as discussed below. For purposes of conducting the risk analysis, all the hazard impact areas were defined as the percentage of area in each census block that would be affected.

3.4.2.1 Flooding

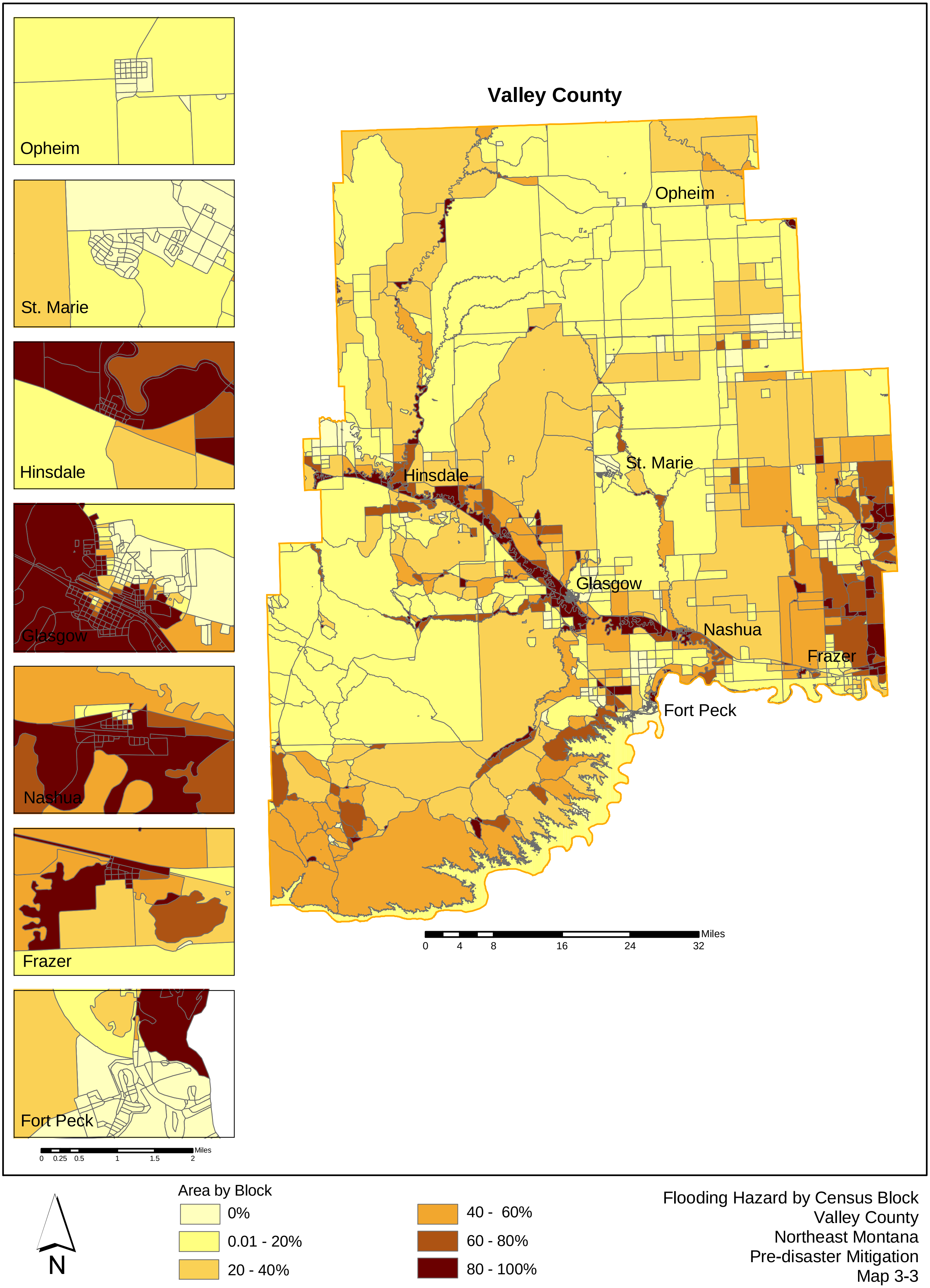
Ideally flooding would be modeled by using floodplain maps. The types of floodplain maps required to model flooding in a Geographic Information System (GIS) are vector representations of the floodplain boundaries like the FEMA Q3 maps. Currently, there are no FEMA Q3 digital flood data for the project area. In order to conduct an analysis of flood impacts, a generalized model of potential flood areas was developed by reviewing the existing flood plain maps and modeling them using data that does exist. Potential flooding areas of impact were created by identifying all rivers and streams upstream of a major flood control dam, and buffering them using the following criteria:

- Rivers 2500 feet each side
- Perennial Streams 1750 feet each side
- Intermittent Streams 750 feet each side

The buffered areas were then intersected with the census blocks in the GIS to define area of impact by block. ***Map 3-3*** depicts the percentage of area potentially impacted by flooding by census block. The disadvantage to this method is that it is fairly general and doesn't adequately address known flood prone areas. The advantages of this method are that the floodplain models are at a comparable level of spatial resolution to the data that they are being used to analyze (census blocks) and that it is not biased to only account for flood areas that currently are impacting structures.

3.4.2.2 Winter Storms

The entire project area is in a single climate region (BSk) according to the Köppen Climate Classification for the Conterminous United States developed by the Idaho State Climate Services Center at the University of Idaho. Characteristics of the BSk classification are:



Flooding Hazard by Census Block
Valley County
Northeast Montana
Pre-disaster Mitigation
Map 3-3

- Semi-Arid, Steppe (Cool)
- Evaporation Exceeds Precipitation on Average
- Precipitation is More than Half but Less than Potential Evaporation
- Mean Average Temp is Below 18c/64.4f

Topographically there are no significant features that generate localized climate conditions that present significant changes in hazard risk in the project area. Therefore the hazard profile area for winter storms is uniform over the entire project area.

3.4.2.3 Wildfire

Grass and brush fires represent the greatest wildland fire risk for the project area. According to the Urban Wildland Interface Code: 2000 published by the International Fire Code Institute (IFCI) a "Light Fuel" is vegetation consisting of herbaceous plants and round wood less than ¼ inch in diameter – Grassland would fall in this category. Grassland in the project area is mainly composed of grazing land and farmland that is currently in the NRCS Conservation Reserve Program (CRP land). Because there is a significant amount of land in the CRP program in the project area and land is consistently being added and retracted from the CRP, all agricultural land was classified as potential wildfire risk areas. A Medium Fuel according to the Urban Wildland Interface Code: 2000 is vegetation consisting of round wood 1/3 to 3 inches in diameter. Shrub and grassland in the project area fit into this category.

The National Land Cover Data from the US Geological Survey (USGS) was used to define agricultural, grass, and shrub land for the project area. ***Map 3-4*** depicts fire risk areas. Data from the USFS Wildland Fire Assessment System were also evaluated for use in modeling fire risk but was determined to be too general for the project area.

3.4.2.4 Severe Thunderstorms

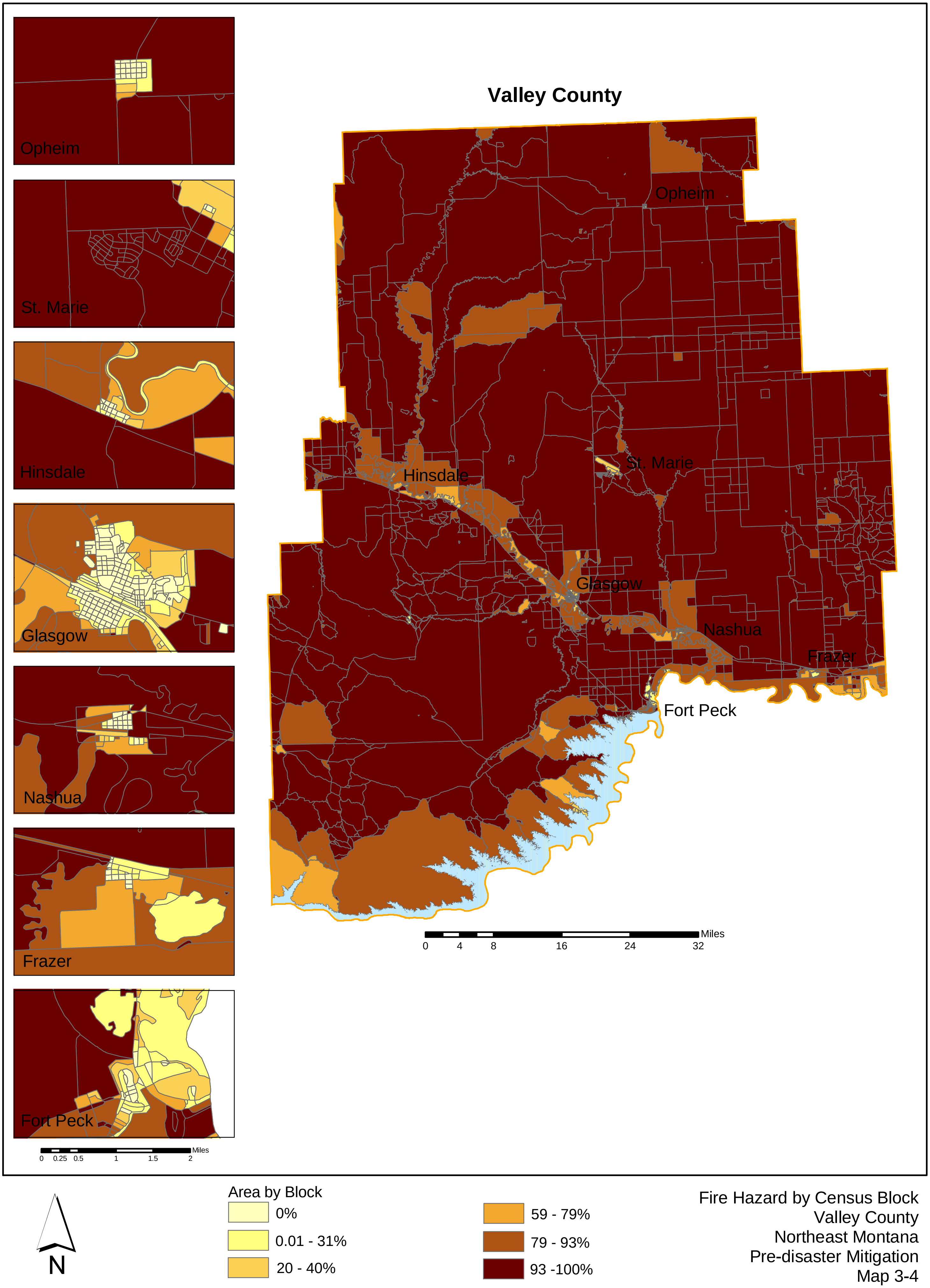
According to FEMA's wind zone classifications the entire project area is in Zone II (160 MPH Design Wind Speeds). According to FEMA the project area also has a single classification for tornado frequency (<1 Per 1000 square miles). Based on review of weather data and the determinations made for tornadoes, windstorms and winter storms, the entire project area has been classified with a uniform risk for severe thunderstorms including tornadoes and hail.

3.4.2.5 Human-Caused and Technological Hazards

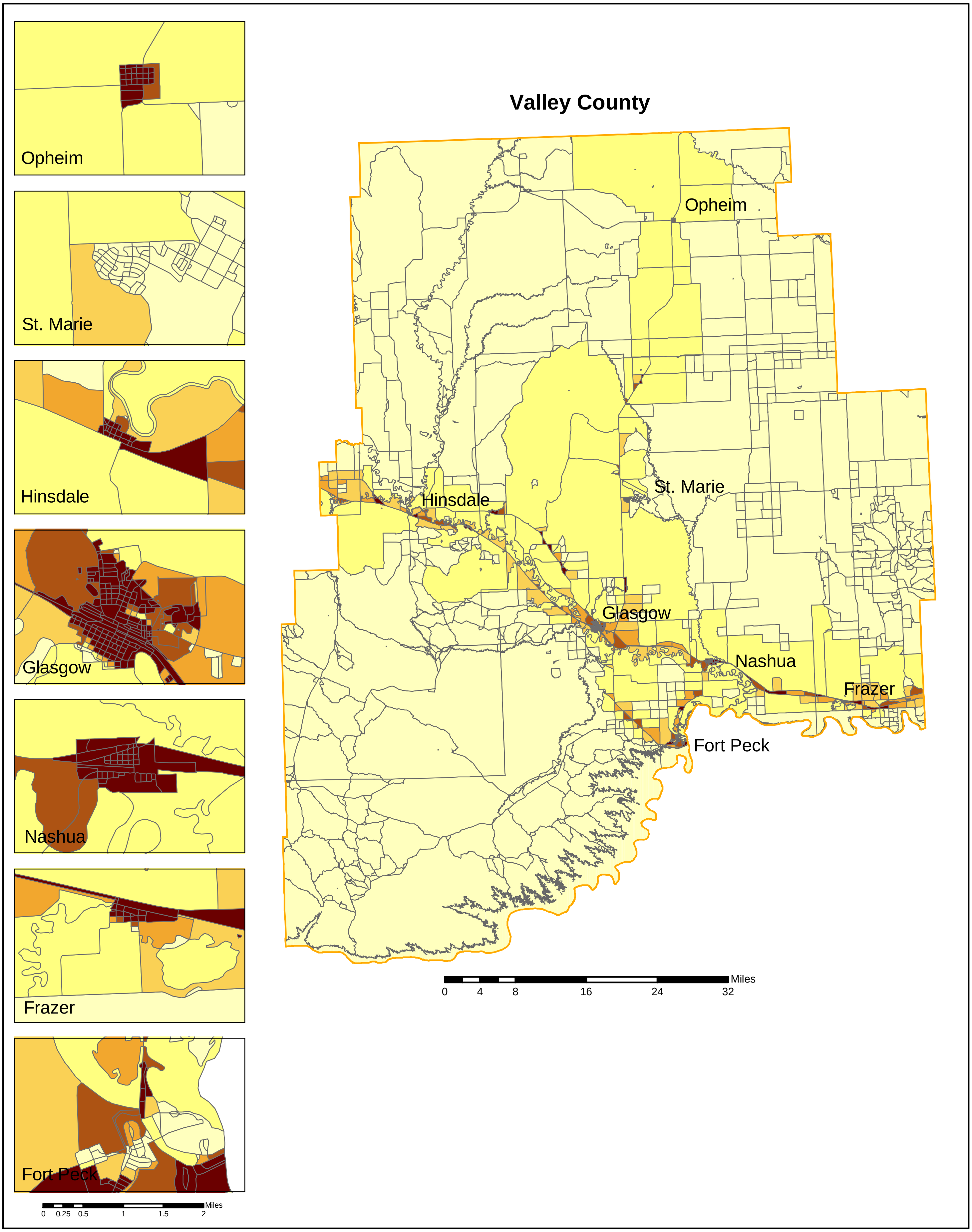
Based on review of historical accounts of human-caused and technological hazards, the DES Hazardous Material Response database, and input from the public meetings, it was determined that a significant component of risk in this category was related to transportation of hazardous materials and transportation infrastructure. To model the spatial distribution of this risk we developed a GIS data layer of major transportation arteries, which included highways and railroad lines, buffered them by 0.25 miles, and then calculated the impact area by census block. ***Map 3-5*** depicts Transportation Related Technological Risk Areas.

3.4.2.6 Cumulative Hazard Areas

Cumulative hazards for the project area were calculated by summing the percent of each census block that contained flooding, fire, and transportation hazards. Other hazards where not included because they were determined to have uniform spatial distribution across the project area. ***Map 3-6*** depicts cumulative hazard areas by census block.



Fire Hazard by Census Block
Valley County
Northeast Montana
Pre-disaster Mitigation
Map 3-4

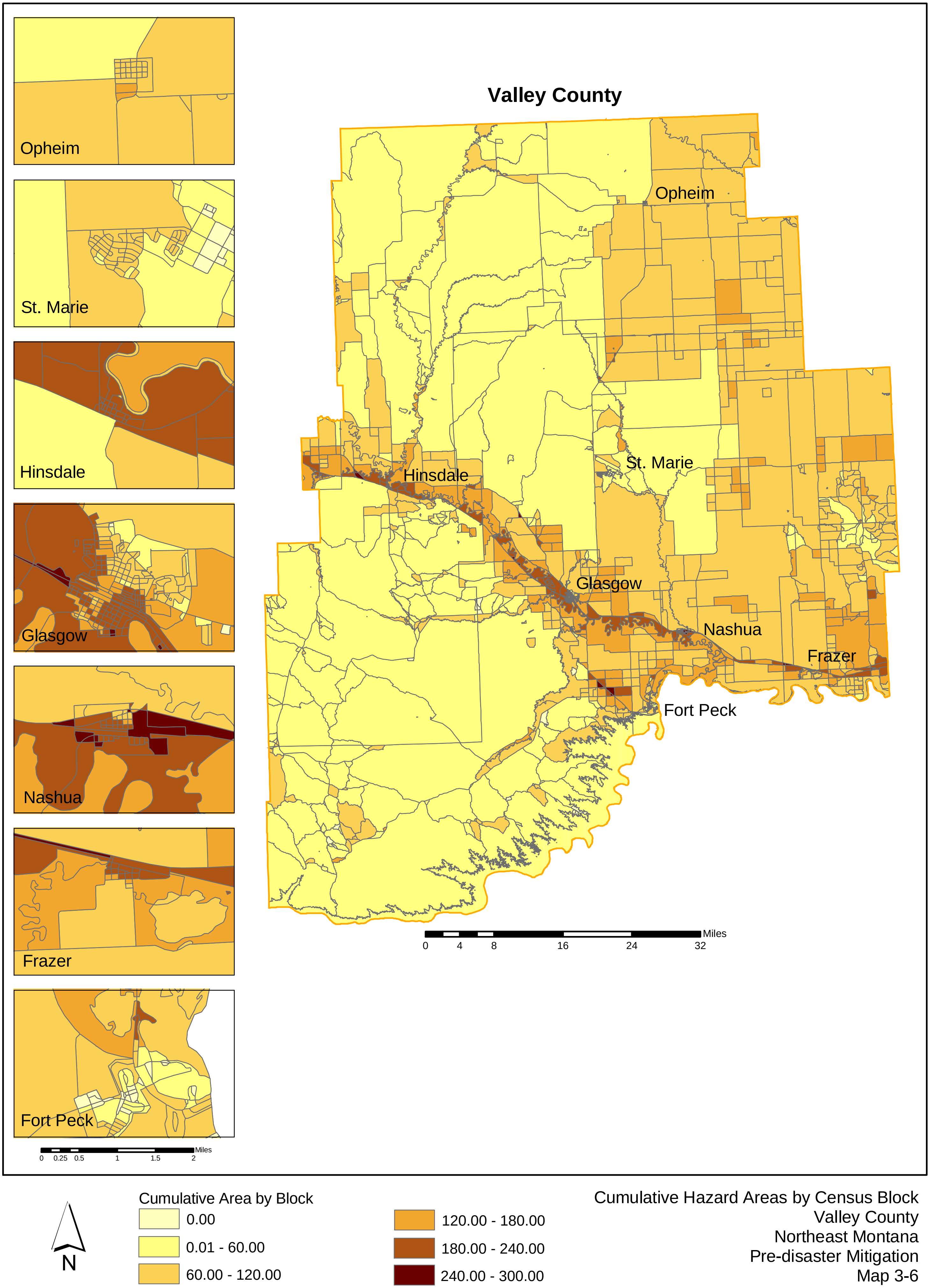


N

Area by Block

- 0%
- 0.01 - 20%
- 20 - 40%
- 40 - 60%
- 60 - 80%
- 80 -100%

Transportation Hazard by Census Block
Valley County
Northeast Montana
Pre-disaster Mitigation
Map 3-5



Cumulative Hazard Areas by Census Block
Valley County
Northeast Montana
Pre-disaster Mitigation
Map 3-6

Estimating potential losses and calculating risk requires evaluating where hazard areas and vulnerabilities to them coincide, how frequently the hazards occur, and then estimating the magnitude of damage resulting from a hazard event.

3.5 ASSESSING VULNERABILITY: ESTIMATING POTENTIAL LOSSES

3.5.1 Hazard Magnitudes

The percentage of structures or people exposed to a hazard who are negatively impacted is related to the nature of the hazard and intensity of the event and is expressed as the hazard magnitude. The hazard magnitude is required to develop estimates of structures and people impacted by the hazard. For this risk assessment, hazard magnitude estimates were developed by researching historical disaster records and other relevant data related to hazard intensity. Hazard magnitudes are expressed as a percent of structures or people impacted.

3.5.2 Risk Calculations

Risk calculations present a quantitative assessment of the vulnerability of structures, people, and critical facilities to individual hazards and cumulatively to all hazards. The equation used to develop the overall risk values is:

- Exposure x Frequency x Hazard Loss Magnitude

Where :

- Exposure = structures, vulnerable population, or critical facilities at risk as determined in ***Plan Section 3.4.2***
- Frequency = annual number of events determined by calculating the (number of hazard events / period of record) as described in ***Plan Section 3.4.1***
- Magnitude = percent of damage expected as described in ***Plan Section 3.5.1*** and presented in ***Table 3-10***

Table 3-10 presents the results of the risk calculations. While the results are presented as dollar values for Building $ Risk, numbers of people effected for Societal Risk, and numbers of facilities effected, they should not be interpreted literally as estimates of actual values. Due to data and modeling limitations the values presented are more appropriately used to evaluate the relative risk posed by the different hazard types. **Tables 3-11 through 3-14** contain the risk calculations for the incorporated towns of Glasgow, Fort Peck, Nashua, and Opheim.

TABLE 3-10
VALLEY COUNTY HAZARD VULNERABILITY ASSESSMENTS

Hazard	Frequency	Magnitude	Building $ Exposure	Societal Exposure	Critical Facilities Exposure	Building $ Risk	Societal Risk	Critical Facilities Risk
Flooding	1.7	20.00%	$260,052,177	3881.37	50.29	$88,417,740	1319.67	17.10
Winter Storms	2.2	2.00%	$571,864,000	7882.00	95.00	$25,162,016	346.81	4.18
Wildfire	90.5	0.15%	$238,532,295	3064.92	20.7	$32,380,759	416.06	2.81
Tornadoes	0.71	0.50%	$571,864,000	7882.00	95.00	$2,030,117	27.98	0.34
Wind/Hail Thunderstorms	7.5	0.10%	$571,864,000	7882.00	95.00	$4,288,980	59.12	0.71
Technological	1.7	0.10%	$315,750,941	4542.97	76.91	$536,777	7.72	0.13
Cumulative			$2,529,927,413	35135.27	432.90	$152,816,389	2,177.36	25.27

TABLE 3-11
FORT PECK HAZARD VULNERABILITY ASSESSMENTS

Hazard	Frequency	Magnitude	Building $ Exposure	Societal Exposure	Critical Facilities Exposure	Building $ Risk	Societal Risk	Critical Facilities Risk
Flooding	1.7	20.00%	$990,958	10.11	0.00	$336,926	3.44	0.00
Winter Storms	2.2	2.00%	$23,098,090	235.67	8.00	$1,016,316	10.37	0.35
Wildfire	90.5	0.15%	$4,967,305	50.68	0.04	$674,312	6.88	0.01
Tornadoes	0.71	0.50%	$23,098,090	235.67	8.00	$81,998	0.84	0.03
Wind/Hail Thunderstorms	7.5	0.10%	$23,098,090	235.67	8.00	$173,236	1.77	0.06
Technological	1.7	0.10%	$4,918,301	50.18	2.26	$8,361	0.09	0.00
Cumulative			$80,170,833	817.98	26.30	$2,291,148	23.38	0.45

TABLE 3-12
GLASGOW HAZARD VULNERABILITY ASSESSMENTS

Hazard	Frequency	Magnitude	Building $ Exposure	Societal Exposure	Critical Facilities Exposure	Building $ Risk	Societal Risk	Critical Facilities Risk
Flooding	1.7	20.00%	$115,777,006	1929.13	33.37	$39,364,182	655.90	11.35
Winter Storms	2.2	2.00%	$255,941,738	3821.77	48.00	$11,261,436	168.16	2.11
Wildfire	90.5	0.15%	$18,124,632	237.66	8.39	$2,460,419	32.26	1.14
Tornadoes	0.71	0.50%	$255,941,738	3821.77	48.00	$908,593	13.57	0.17
Wind/Hail Thunderstorms	7.5	0.10%	$255,941,738	3821.77	48.00	$1,919,563	28.66	0.36
Technological	1.7	0.10%	$220,991,545	3307.12	41.87	$375,686	5.62	0.07
Cumulative			$1,122,718,398	16939.22	227.63	$56,289,879	904.18	15.20

TABLE 3-13
NASHUA HAZARD VULNERABILITY ASSESSMENTS

Hazard	Frequency	Magnitude	Building $ Exposure	Societal Exposure	Critical Facilities Exposure	Building $ Risk	Societal Risk	Critical Facilities Risk
Flooding	1.7	20.00%	$22,186,271	262.29	4.63	$7,543,332	89.18	1.58
Winter Storms	2.2	2.00%	$28,090,258	331.06	6.00	$1,235,971	14.57	0.26
Wildfire	90.5	0.15%	$7,246,106	83	3.28	$983,659	11.27	0.45
Tornadoes	0.71	0.50%	$28,090,258	331.06	6.00	$99,720	1.18	0.02
Wind/Hail Thunderstorms	7.5	0.10%	$28,090,258	331.06	6.00	$210,677	2.48	0.05
Technological	1.7	0.10%	$24,610,910	293.42	5.79	$41,839	0.50	0.01
Cumulative			$138,314,060	1631.89	31.70	$10,115,198	119.17	2.36

TABLE 3-14
OPHEIM HAZARD VULNERABILITY ASSESSMENTS

Hazard	Frequency	Magnitude	Building $ Exposure	Societal Exposure	Critical Facilities Exposure	Building $ Risk	Societal Risk	Critical Facilities Risk
Flooding	1.7	20.00%	$272,259	3.29	0.07	$92,568	1.12	0.02
Winter Storms	2.2	2.00%	$12,890,224	155.54	14.00	$567,170	6.84	0.62
Wildfire	90.5	0.15%	$4,712,572	56.87	0.97	$639,732	7.72	0.13
Tornadoes	0.71	0.50%	$12,890,224	155.54	14.00	$45,760	0.55	0.05
Wind/Hail Thunderstorms	7.5	0.10%	$12,890,224	155.54	14.00	$96,677	1.17	0.11
Technological	1.7	0.10%	$8,014,612	96.71	13.03	$13,625	0.16	0.02
Cumulative			$51,670,116	623.49	56.06	$1,455,531	17.56	0.95

4.0 MITIGATION STRATEGY

Specific mitigation goals and projects were developed for Valley County in conjunction with public meetings held in four communities and stakeholder interviews. A matrix developed for project ranking emphasizing cost-benefit and input from local officials was used to determine project prioritization. Following is a description of goals and objectives used to mitigate natural and technological hazards that build on the community's existing capabilities. Project implementation and legal framework are discussed at the conclusion of this section.

4.1 LOCAL HAZARD MITIGATION GOALS

The Plan goals describe the overall direction that Valley County agencies, organizations, and citizens can take to work toward mitigating risk from natural and technological hazards. Goals and objectives of the Plan were developed during interviews and meetings with public officials and at public meetings held in Glasgow, Nashua, Opheim, and Fort Peck. Valley County hazard mitigation goals are identified below with reference to the specific jurisdiction identifying each as their goal.

- Reduce Impacts from Flooding – identified goal by communities of Glasgow and Nashua
- Enhance Early Warning Systems – identified goal by all communities
- Minimize Risk of Wildfire at Urban Interface – identified goal by all communities
- Improve Fire Fighting Capabilities – identified goal by Glasgow and Opheim
- Reduce Fire Risk at Tourist Facilities – identified goal by the community of Fort Peck
- Enhance Emergency Response Capabilities - identified goal by all communities
- Secure Integrity of Utilities and Infrastructure – goal identified by Glasgow and Nashua
- Reduce Risk of Hazardous Material Incidents – goal identified by Opheim and Fort Peck
- Reduce Risk of Biological Hazards – goal identified by Fort Peck

4.2 MITIGATION OBJECTIVES AND ACTIONS

The broad range of potential mitigation activities presented in ***Appendix D*** were considered, and below is a list of mitigation objectives and the actions (projects) identified by the County. Projects marked with an asterisk are response-related actions identified as County priorities. Although these projects may not be eligible for FEMA funding, Counties may secure alternate funding sources to implement these projects in the future. Mitigation projects specific to individual jurisdictions are noted within the list.

Reduce Impacts from Flooding

- Repair dikes around south side of Glasgow
- Extend dikes along west side of Glasgow
- Consider ways to mitigate flood impacts to Green Meadow Estates in Glasgow (subdivision located in Milk River floodplain)
- Update diversion dams in southwest corner of County
- Increase size of ditch behind homes in Hinsdale near Tank Coulee
- Upgrade storm sewers in Glasgow to mitigate drainage problems
- Construct dam on Porcupine Creek to divert flow from entering Milk River
- Upgrade dikes west of Nashua (Levi's House)
- Raise grade of north-south road in Nashua
- Consider mitigations for three houses in floodplain in Nashua
- Negotiate with FEMA to accept Nashua flood control system
- Install backflow valve on Nashua storm sewer system

- Add automated river gage at Glasgow
- Measure foundation elevations of rural residences
- Negotiate pre-flood season release from Fresno Dam to minimize ice jams
- Include water equivalent measurements in routine weekly Coop observation sites

Enhance Early Warning Capabilities
- Buy weather radios for various critical facilities
- Provide weather radios or scanners at discount to area residents
- Update siren system in Glasgow, Fort Peck, Richland, Opheim, Nashua, Hinsdale
- Upgrade emergency advisory equipment at radio station
- Install antennae west of The Pines for ham radio communication
- Install web-cam on face of Fort Peck dam to enhance high wind advisory system
- Re-broadcast NOAA weather station on local AM radio in Opheim
- Enhance NOAA broadcasts to include northern Valley County by installing one-way antennae in Opheim
- Better broadcast burn day restrictions, especially during Red Flag events
- Obtain RTV weather warning equipment for the 3 channels in Valley County

Minimize Risk of Wildfire at Urban Interface
- Institute weed control measures (mowing/brush clearing) along railroad in Glasgow and Nashua, and around town of Opheim
- Construct fire guards (breaks) upwind of Opheim and in CRP fields
- Remove old abandoned buildings in Opheim, Fort Peck, and Nashua
- Hay CRP fields
- Modify railroad operations and equipment for synoptic scale high wind events
- Construct fire break network at the Pines and for certain CRP locations

Improve Fire Fighting Capabilities
- Increase pressure at water hydrants in Glasgow
- Install dry hydrants in fields around Opheim
- Provide additional training to fire fighters
- * Purchase turn-out gear for Opheim
- * Provide training and equipment for fighting oil-field fires in Lustre

Reduce Fire Risk at Tourist Facilities
- Install sprinkler system in Fort Peck Theater
- Install metal roof on Fort Peck Theater

Enhance Emergency Response Systems
- * Provide generator for water treatment plant, lift station, pumping stations
- * Provide generators for nursing homes and shelters in Glasgow
- Tie into Dry Prairie pipeline for backup water supply for Glasgow
- Coordinate emergency response activities between railroad/city/county
- Develop alternate evacuation route for Nashua (train blocks access routes)
- Provide training and software on hazardous materials to emergency managers
- * Purchase snowcat (snowmobile) as response vehicle for Nashua
- Identify emergency shelter in Nashua and equip with generator
- Provide two-way switches for generators
- Provide training to first responders
- Recruit EMT volunteers through public outreach

Secure Integrity of Utilities and Infrastructure

- Install fencing and alarm system at water treatment plant and water supply wells

Reduce Risk of Hazardous Material Incidents

- Secure bulk petroleum, propane, and anhydrous ammonia tanks with fencing
- Provide awareness training on meth labs
- Network with Corps of Engineers and Western Area Power Administration on haz-mat preparedness planning
- Enhance railroad chemical spill mitigation

Reduce Risk of Biological Hazards

- Investigate mitigation options for West Nile Virus

4.3 PROJECT RANKING AND PRIORITIZATION

A cost-benefit matrix was developed to rank the mitigation projects using the following criteria. Each project was assigned a "high", "medium", or "low" rank for *Population Impacted, Property Impacted*, and *Cost*. For the *Population Impacted* category, a "high" rank represents greater than 50 percent of County residents; a "medium" rank represents 20 to 50 percent of County residents; and a "low" rank represents less than 20 percent of County residents. For the *Property Impacted* and *Project Cost* categories, a "high" rank represents greater than $500,000, a "medium" rank represents between $100,000 and $500,000, and a "low" rank is less than $100,000. The matrix was completed by assigning each rank a numeric value as follows:

TABLE 4-1
COST-BENEFIT SCORING MATRIX

	Population Impacted	Property Impacted	Cost
High	7	7	1
Medium	5	5	5
Low	1	1	7

The overall cost-benefit was then calculated by summing the total score for each project. ***Table 4-2*** presents the Hazard Mitigation Project Cost-Benefit Matrix for Valley County.

The DES Coordinator, consulting with the Local Emergency Planning Committee (LEPC), also ranked each mitigation project as "high", "medium", and "low" based on community priorities. Projects identified by Valley County as top priorities and their cost/benefit ranking, are presented in ***Table 4-3.***

4.4 PROJECT IMPLEMENTATION AND LEGAL FRAMEWORK

Once the Valley County PDM Plan is formally adopted, the County will use the cost-benefit analysis in the Plan to focus project prioritization. Mitigation projects will be considered for funding through federal and state grant programs, and when other funds are made available through the County. The LEPC, a consortium of local officials and disaster planning personnel, will be the coordinating agency for

TABLE 4-2
VALLEY COUNTY COST/BENEFIT RANKING OF HAZARD MITIGATION PROJECTS

GOAL	*HAZARD MITIGATION PROJECTS*	*HAZARDS MITIGATED*	*GLASGOW JURISDICTION*	*FORT PECK JURISDICTION*	*OPHEIM JURISDICTION*	*NASHUA JURISDICTION*	*VALLEY COUNTY JURISDICTION*	*POPULATION IMPACTED*	*PROPERTY IMPACTED*	*PROJECT COST*	*COST/BENEFIT RANKING*
Enhance Early Warning Capabilities	Buy weather radios for various critical facilities	Fire, Flooding, Winter Storms, Tornadoes	X	X	X	X		High	High	Low	High
Enhance Early Warning Capabilities	Provide weather radios or scanners at discount to area residents	Fire, Flooding, Winter Storms, Tornadoes	X	X	X	X		High	High	Low	High
Enhance Early Warning Capabilities	Upgrade emergency advisory equipment at radio station	Fire, Flooding, Tornadoes	X					High	High	Low	High
Reduce Impacts from Flooding	Negotiate with FEMA to accept Nashua flood control system	Flooding				X		High	High	Low	High
Enhance Early Warning Capabilities	Enhance NOAA broadcasts to include northern Valley County by installing one-way antennae in Opheim	Fire, Flooding, Winter Storms, Tornadoes			X			High	High	Low	High
Reduce Impacts from Flooding	Repair dikes around south side of Glasgow	Flooding	X					Medium	High	Medium	High
Reduce Impacts from Flooding	Extend dikes along west side of Glasgow	Flooding	X					Medium	High	Medium	High
Enhance Emergency Response Systems	Identify emergency shelter in Nashua and equip with generator	Winter Storms				X		Medium	Medium	Low	High
Enhance Emergency Response Systems	Provide generator for water treatment plant, lift station, pumping stations	Technological	X			X		High	High	Low	High
Enhance Emergency Response Systems	Provide two-way switches for generators	Winter Storms	X	X	X	X		High	High	Low	High
Minimize Risk of Wildfire at Urban Interface	Hay CRP fields	Fire			X			Medium	Medium	Low	High
Improve Fire Fighting Capabilities	Increase pressure at water hydrants in Glasgow	Fire	X					High	High	High	High
Enhance Early Warning Capabilities	Install one-way antennae in Opheim to receive weather broadcasts from NOAA	Fire, Flooding, Winter Storms, Tornadoes			X			High	High	Low	High
Enhance Early Warning Capabilities	Update siren system in Glasgow, Fort Peck, Richland, Opheim, Nashua, Hinsdale	Fire, Flooding, Tornadoes	X	X	X	X	X	High	High	Low	High
Minimize Risk of Wildfire at Urban Interface	Institute weed control measures (mowing/brush clearing) along railroad in Glasgow and Nashua, and around town of Opheim	Fire	X		X	X		Medium	High	Low	High
Minimize Risk of Wildfire at Urban Interface	Construct fire guards (breaks) upwind of Opheim and in CRP fields	Fire			X			Medium	Medium	Low	High
Improve Fire Fighting Capabilities	Provide additional training to fire fighters	Fire			X			Medium	Medium	Low	High

TABLE 4-2

VALLEY COUNTY COST/BENEFIT RANKING OF HAZARD MITIGATION PROJECTS

GOAL	*HAZARD MITIGATION PROJECTS*	*HAZARDS MITIGATED*	*GLASGOW JURISDICTION*	*FORT PECK JURISDICTION*	*OPHEIM JURISDICTION*	*NASHUA JURISDICTION*	*VALLEY COUNTY JURISDICTION*	*POPULATION IMPACTED*	*PROPERTY IMPACTED*	*PROJECT COST*	*COST/BENEFIT RANKING*
Improve Fire Fighting Capabilities	Provide training to first responders	Fire, Flooding, Winter Storms, Tornadoes	X	X				Medium	Medium	Low	High
Improve Fire Fighting Capabilities	Recruit EMT volunteers through public outreach	Fire, Flooding, Winter Storms, Tornadoes		X				Medium	Medium	Low	High
Reduce Impacts from Flooding	Install backflow valve on Nashua storm sewer system	Flooding				X		Medium	Medium	Low	High
Enhance Emergency Response Systems	Provide generators for nursing homes and shelters in Glasgow	Winter Storms	X					High	High	Low	High
Minimize Risk of Wildfire at Urban Interface	Remove old abandoned buildings in Opheim, Fort Peck, and Nashua	Fire		X	X	X		Medium	Medium	Low	High
Improve Fire Fighting Capabilities	Purchase turn-out gear for Opheim	Fire			X			Medium	Medium	Low	High
Enhance Emergency Response Systems	Coordinate emergency response activities between railroad/city/county	Fire	X			X		Medium	Medium	Low	High
Reduce Risk of Hazardous Material Incidents	Secure bulk petroleum, propane, and anhydrous ammonia tanks with fencing	Technological			X			Medium	Medium	Low	High
Minimize Risk of Wildfire at Urban Interface	Install dry hydrants in fields around Opheim	Fire			X			Medium	Medium	Medium	Medium
Reduce Impacts from Flooding	Increase size of ditch behind homes in Hinsdale near Tank Coulee	Flooding					X	Medium	Medium	Medium	Medium
Reduce Impacts from Flooding	Upgrade dikes west of Nashua	Flooding				X		Medium	Medium	Medium	Medium
Reduce Impacts from Flooding	Consider ways to mitigate flood impacts to Green Meadow Estates in Glasgow (subdivision located in Milk River floodplain)	Flooding	X					Medium	Medium	High	Medium
Reduce Impacts from Flooding	Construct dam on Porcupine Creek to divert flow from entering Milk River	Flooding				X		Medium	Medium	High	Medium
Reduce Impacts from Flooding	Raise grade of north-south road in Nashua	Flooding				X		Medium	Medium	Medium	Medium
Reduce Impacts from Flooding	Upgrade storm sewers in Glasgow to mitigate drainage problems	Flooding	X					Medium	Medium	High	Medium
Reduce Risk of Biological Hazards	Investigate mitigation options for West Nile Virus	Technological		X				Low	Low	Low	Medium
Enhance Emergency Response Systems	Develop alternate evacuation route for Nashua (train blocks access routes)	Fire				X		Medium	Medium	Medium	Medium

TABLE 4-2

VALLEY COUNTY COST/BENEFIT RANKING OF HAZARD MITIGATION PROJECTS

GOAL	*HAZARD MITIGATION PROJECTS*	*HAZARDS MITIGATED*	*GLASGOW JURISDICTION*	*FORT PECK JURISDICTION*	*OPHEIM JURISDICTION*	*NASHUA JURISDICTION*	*VALLEY COUNTY JURISDICTION*	*POPULATION IMPACTED*	*PROPERTY IMPACTED*	*PROJECT COST*	*COST/BENEFIT RANKING*
Secure Integrity of Utilities and Infrastructure	Install fencing and alarm system at water treatment plant and water supply wells	Technological	X			X		High	Low	Medium	Medium
Enhance Emergency Response Systems	Provide training and software on hazardous materials to emergency managers	Technological				X		Medium	Low	Low	Medium
Enhance Emergency Response Systems	Tie into Dry Prairie pipeline for backup water supply for Glasgow	Drought, Technological	X					High	Low	High	Medium
Reduce Risk of Hazardous Material Incidents	Network with Corps of Engineers and WAPA on haz-mat preparedness planning	Technological		X				Low	Low	Low	Medium
Enhance Emergency Response Systems	Purchase snowcat (snowmobile) as response vehicle for Nashua	Winter Storms				X		Low	Low	Low	Medium
Reduce Fire Risk at Tourist Facilities	Install sprinkler system in Fort Peck Theater	Fire		X				Low	Medium	Medium	Medium
Reduce Fire Risk at Tourist Facilities	Install metal roof on Fort Peck Theater	Fire		X				Low	Medium	Medium	Medium
Enhance Early Warning Capabilities	Install antennae west of The Pines for ham radio communication	Fire, Flooding, Winter Storms, Tornadoes					X	Low	Low	Low	Medium
Reduce Risk of Hazardous Material Incidents	Provide awareness training on meth labs	Technological	X	X	X			Low	Low	Low	Medium
Enhance Emergency Response Systems	Install web-cam on face of Fort Peck dam to enhance high wind advisory system	Wind		X				Low	Low	Low	Medium
Reduce Impacts from Flooding	Consider mitigations for three houses in floodplain in Nashua	Flooding				X		Low	Medium	High	Low
Improve Fire Fighting Capabilities	Provide training and equipment for fighting oil-field fires in Lustre	Fire					X	Low	Low	Medium	Low
Reduce Impacts from Flooding	Update diversion dams in southwest corner of County	Flooding					X	Low	Low	Medium	Low
Reduce Impacts from Flooding	Add automated river gage at Glasgow	Flooding	X					High	High	Medium	High
Reduce Impacts from Flooding	Include water equivalent measurements in routine weekly Coop observation sites	Drought					X	High	High	Low	High
Minimize Risk of Wildfire at Urban Interface	Modify railroad operations and equipment for synoptic scale high wind events	Fire	X			X		Medium	High	High	Medium

TABLE 4-2

VALLEY COUNTY COST/BENEFIT RANKING OF HAZARD MITIGATION PROJECTS

GOAL	*HAZARD MITIGATION PROJECTS*	*HAZARDS MITIGATED*	*GLASGOW JURISDICTION*	*FORT PECK JURISDICTION*	*OPHEIM JURISDICTION*	*NASHUA JURISDICTION*	*VALLEY COUNTY JURISDICTION*	*POPULATION IMPACTED*	*PROPERTY IMPACTED*	*PROJECT COST*	*COST/BENEFIT RANKING*
Reduce Risk of Hazardous Material Incidents	Enhance railroad chemical spill mitigation	Technological	X			X		High	Medium	Medium	High
Enhance Early Warning Capabilities	Better broadcast burn day restrictions, especially during Red Flag events	Fire					X	High	High	Low	High
Minimize Risk of Wildfire at Urban Interface	Construct fire break network at the Pines and for certain CRP locations	Fire					X	High	High	Low	High
Enhance Early Warning Capabilities	Obtain RTV weather warning equipment for the 3 channels in Valley County	Fire, Flooding, Winter Storms, Tornadoes	X	X	X	X		High	High	Low	High
Reduce Impacts from Flooding	Measure foundation elevations of rural residences	Flooding					X	Medium	Medium	Medium	Medium
Reduce Impacts from Flooding	Negotiate pre-flood season release from Fresno Dam to minimize ice jam hazard	Flooding					X	High	High	Medium	High
Reduce Impacts from Flooding	Improve floodplain maps	Flooding	X			X	X	High	High	Medium	High
Reduce Impacts from Flooding	Improve public awareness of flood risk, flood insurance and flood construction regulations	Flooding	X			X	X	High	High	Low	High
Reduce Impacts from Flooding	Improve coordination with local, county, state, and federal agencies	Flooding	X			X	X	High	High	Low	High
Reduce Impacts from Flooding	Protect public infrastructure, buildings and public utilities	Flooding	X			X	X	High	High	High	High
Reduce Impacts from Flooding	Minimize flood damages to buildings and personal property (see Flood Hazard Mitigation Plan for priority order)	Flooding	X			X	X	High	High	High	High
Reduce Impacts from Flooding	Maintain or improve the regulation of the 100-year floodplain	Flooding	X			X	X	High	High	Medium	High
Enhance Early Warning Capabilities	Obtain EAS equipment for the local PBS station	Fire, Flooding, Winter Storms, Tornadoes	X	X	X	X	X	Medium	Medium	Medium	Medium
Reduce Impacts from Flooding	Improve subdivision regulations countywide	Flooding	X	X	X	X	X	High	Medium	Low	High

POPULATION IMPACTED

High = > 50% of County residents

Medium = 20 to 50% of County residents

Low = < 20% County residents

PROPERTY IMPACTED & PROJECT COST

High = > $500,000

Medium = $100,000 to $500,000

Low = < $100,000

COST BENEFIT FORMULA

High = "5" for Population Impacted & Property Impacted; "1" for Cost

Medium = "3" for Population Impacted & Property Impacted; "3" for Cost

Low = "1" for Population Impacted & Property Impacted; "5" for Cost

COST/BENEFIT RANKING

High = 11 to 15

Medium = 6 to 10

Low = 0 to 5

TABLE 4-3
VALLEY COUNTY HIGH PRIORITY
HAZARD MITIGATION PROJECTS

GOAL	***HAZARD MITIGATION PROJECTS***	***HAZARDS MITIGATED***	***COUNTY PRIORITY***	***COST/BENEFIT RANKING***
Enhance Early Warning Capabilities	Buy weather radios for various critical facilities	Fire, Flooding, Winter Storms, Tornadoes	High	High
Enhance Early Warning Capabilities	Provide weather radios or scanners at discount to area residents	Fire, Flooding, Winter Storms, Tornadoes	High	High
Enhance Early Warning Capabilities	Upgrade emergency advisory equipment at radio station	Fire, Flooding, Tornadoes	High	High
Reduce Impacts from Flooding	Negotiate with FEMA to accept Nashua flood control system	Flooding	High	High
Enhance Early Warning Capabilities	Enhance NOAA broadcasts to include northern Valley County by installing one-way antennae in Opheim	Fire, Flooding, Winter Storms, Tornadoes	High	High
Enhance Early Warning Capabilities	Re-broadcast NOAA weather station on local AM radio in Opheim	Fire, Flooding, Winter Storms, Tornadoes	High	High
Reduce Impacts from Flooding	Repair dikes around south side of Glasgow	Flooding	High	High
Reduce Impacts from Flooding	Extend dikes along west side of Glasgow	Flooding	High	High
Enhance Emergency Response Systems	Identify emergency shelter in Nashua and equip with generator	Winter Storms	High	High
Enhance Emergency Response Systems	* Provide generator for water treatment plant, lift station, pumping stations	Technological	High	High
Enhance Emergency Response Systems	Provide two-way switches for generators	Winter Storms	High	High
Reduce Impacts from Flooding	Consider mitigations for three houses in floodplain in Nashua	Flooding	High	Low
Minimize Risk of Wildfire at Urban Interface	Install dry hydrants in fields around Opheim	Fire	High	Medium
Reduce Impacts from Flooding	Increase size of ditch behind homes in Hinsdale near Tank Coulee	Flooding	High	Medium
Reduce Impacts from Flooding	Upgrade dikes west of Nashua	Flooding	High	Medium
Reduce Impacts from Flooding	Consider ways to mitigate flood impacts to Green Meadow Estates in Glasgow (subdivision located in Milk River floodplain)	Flooding	High	Medium
Reduce Impacts from Flooding	Construct dam on Porcupine Creek to divert flow from entering Milk River	Flooding	High	Medium

project implementation. The LEPC has the capacity to organize resources, prepare grant applications, and oversee project implementation, monitoring, and evaluation. Coordinating organizations may include local, county, or regional agencies that are capable of, or responsible for, implementing activities and programs. The DES Coordinator will be responsible for mitigation project administration.

A number of state and local regulations and policies form the legal framework available to implement Valley County's hazard mitigation goals and projects. A list of these regulations and plans is presented below.

State of Montana

- Montana Subdivision and Platting Act
- Montana Building Codes
- Montana Sanitation in Subdivision
- Shoreline permits

Local

- Valley County Flood Hazard Mitigation Plan
- Valley County Flood Plain Regulations
- Comprehensive Growth Policy (under development)
- Comprehensive Economic Development Strategy Plan
- Valley County Resource and Land Use Plan (interim)
- Valley County Noxious Weed Management Program Plan
- Transportation Development Plan for Glasgow and Valley County
- Operation and Maintenance Plan; Valley County Refuse District #1
- Capital Improvements Plan; Hinsdale County Water and Sewer District
- Valley County Subdivision Regulations
- County Road Encroachment permits
- Septic Sewer permits

A summary of how the PDM Plan can be integrated into this legal framework is presented below.

- Use the PDM Plan to help the County's Comprehensive Growth Plan meet the goal of protecting public health and property from natural hazards.
- Integrate the County's Floodplain Hazard Mitigation Plan and floodplain ordinances into the PDM Plan to help minimize the impacts from flooding.
- Initiate zoning ordinances in conjunction with flood mitigation projects to prevent development in flood-prone areas.
- Partner with other organizations and agencies with similar goals to promote building codes that are more disaster resistant on the State level.
- Develop incentives for local governments, citizens, and businesses to pursue hazard mitigation projects.
- Allocate county resources and assistance for mitigation projects.
- Partner with other organizations and agencies in northeast Montana to support hazard mitigation activities

5.0 PLAN MAINTENANCE PROCEDURES

The Plan maintenance section of this document details the formal process that will ensure that the Valley County Pre-Disaster Mitigation Plan remains an active and relevant document. The Plan maintenance process includes a schedule for monitoring and evaluating the Plan and producing a Plan revision every five years. This section describes how the county will integrate public participation throughout the Plan maintenance process. Also included in this section is an explanation of how Valley County government intends to incorporate the mitigation strategies outlined in this Plan into existing planning mechanisms.

5.1 MONITORING, EVALUATING AND UPDATING THE PLAN

The Valley County Pre-Disaster Mitigation Plan will be reviewed every two years, or as deemed necessary by knowledge of new hazards, vulnerabilities, or other pertinent reasons. The review will determine whether a Plan update is needed prior to the required five year update. The Plan review will identify new mitigation projects and evaluate the effectiveness of mitigation priorities and existing programs.

The DES Coordinator will be responsible for scheduling a meeting of the Valley County board of Commissioners (Board) to review and update the Plan. The meeting will be open to the public and advertised in the local newspaper to solicit public input. The Board, assisted by the Local Emergency Planning Committee (LEPC) and the public will review the goals and mitigation projects to determine their relevance to changing situations in the county, as well as changes in state or federal policy, and to ensure they are addressing current and expected conditions. The Board and public will also review the risk assessment portion of the Plan to determine if this information should be updated or modified, given any new available data. The list of critical facilities will also be reviewed and enhanced with additional details. The DES Coordinator will give a status report detailing the success of various mitigation projects, difficulties encountered, success of coordination efforts, and which strategies should be revised. The status report will be published in the local newspaper to update local citizens.

The DES Coordinator will be responsible for the five year Plan update of the Plan, and will have six months to make appropriate changes to the Plan before submitting it to the Board and public for review and approval. Before the end of the five-year period, the updated Plan will be submitted to the State Hazard Mitigation Officer and the FEMA for acceptance. The DES Coordinator will notify all holders of the county Plan when changes have been made.

5.2 IMPLEMENTATION THROUGH EXISTING PROGRAMS

Valley County is currently developing a Comprehensive Growth Policy to address statewide planning goals and legislative requirements. The Pre-Disaster Mitigation Plan provides a series of projects – many of which will be closely related to the goals and objectives of the County Growth Policy. Valley County will have the opportunity to implement hazard mitigation projects through existing programs and procedures. Local officials will work with the County departments to ensure hazard mitigation projects are consistent with planning goals and integrate them, where appropriate.

Within six months of formal adoption of the PDM plan, mitigation goals will be incorporated into the County Comprehensive Growth Policy. Meetings of the Board will provide an opportunity for local officials to report back on the progress made on the integration of mitigation planning elements into county planning documents and procedures.

5.3 CONTINUED PUBLIC INVOLVEMENT

Valley County is dedicated to involving the public directly in review and updates of the Pre-Disaster Mitigation Plan. The public will have many opportunities to provide feedback about the Plan. Copies of the Plan will be catalogued and kept at all appropriate agencies in the County as well as at the Public Library. The existence and location of these copies will be publicized in the County newspaper. Section 2.0 of the Plan includes the address and the phone number of the DES Coordinator responsible for keeping track of public comments on the Plan.

A series of public meetings will also be held prior to each two year review and five year update, or at lesser intervals when deemed necessary by the LEPC. The meetings will provide the public a forum for which they can express its concerns, opinions, or ideas about the Plan. The DES Coordinator will be responsible for using county resources to publicize the annual public meetings and maintain public involvement through the newspapers and radio.

6.0 REFERENCES

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